Municipal Engineering

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The International Good Roads Congress

By Clarence A. Kenyon, Indianapolis, Ind.

I WAS accredited by Governor Marshall of Indiana as a delegate to attend the "Second International Good Roads Congress" (the first having been held in Paris in 1908) to be held in Brussels from July 31 to August 10, 1910. To this duty I gave my best attention and am sending this necessarily short report of the Congress and my impressions for the benefit of such as may be interested.

As a preliminary word, I perhaps should say that the question of good roads is overwhelming in every country, except the United States; this will appear from the fact that when the permanent International Congress of Roads was formed two years ago, by the Union of various interested countries as members, each country to contribute to the expense and to be represented on the permanent board by one representative for each $200.00 contributed (no country to have in excess of 15 members) the United States did not join. Most of the European countries, Japan, and many of the South and Central American Republics, have made the appropriation and become members, the expense being from two hundred to three thousand dollars, according to the importance of the nation represented. But poor old United States has not become a member, although we are hopeful for the future. The five delegates appointed by the General Government and those delegates appointed by the Governors of various States were invited, and accepted as delegates by courtesy.

In spite of these embarrassments it was a great Congress. Think of 26 nations being represented by over two thousand delegates, mostly eminent civil engineers and road builders or administrators, all working and studying the question of how best to solve the great question of how to get good roads and how to keep them good under increasing and varying traffic conditions.

All of the papers presented by experts, as well as the conclusions of the last Congress, were digested by a corps of experts and formulated into nine "questions" and sub-questions; and these "questions" submitted to the Congress for discussion, amendment or rejection. The large numbers of delegates were divided into sections and sub-sections, and the various questions were submitted to each section, one speaking, say in French, another in English, another in German. If there was any disagreement, the three sections or sub-sections met together, and by the aid of interpreters, each speech being produced in the three languages, the discussion proceeded to a final conclusion. Where there was a diversity of opinion these discussions became animated and at times very interesting. As an example, the "question" under discussion condemned the macadam and gravel pavements and roadways, except for very light travel, and more or less by inference included mixtures of broken stone and gravel with tar, pitch and other bituminous substances.

The English delegates, comprising a corps of great engineers, as well as the American delegates, opposed this. In England as great and even greater advances are being made with tar and asphalt mixtures as are being made in the United States, and the English engineers are looking forward to this form of construction as the hope of the future, to preserve and protect their highways from the destructive effects of the ever increasing automobile traffic, at a cost that is within the reach of the tax payers.

The debate lasted, in section and sub-section, for two days and part of a third. The Continental delegates finally gave way on the latter part of the question and it was amended accordingly.

After all of the "questions" had been debated, amended, rejected or agreed

to, a grand final meeting was held, every delegate in full dress (as they were required to be at all formal meetings) and each question and sub-question was formally adopted.

To attempt to give these questions in a short report like this is not practicable, but I may give a few ideas taken from the questions and debates that may be valuable:

1. In the construction of roads and streets, good drainage, first class material and construction should not be sacrificed to mere cheapness, as they are most important in the years of upkeep to follow. The universal demand that everyone constantly repeats here is "conserve and maintain." It is regarded as a crime to spend the people's money to build roads and then fail to provide adequately for their upkeep. Nearly everyone I talked with could not understand the indifference of our people to good roads and especially to their upkeep. They cannot understand why we keep the obsolete system of "working out the road tax"; why loads of stone or gravel are dumped in the center of roads and such act called a repair; why the control of the roads and their upkeep is in the hands of county commissioners and township road supervisors; and that there are ninety-two sets of such officials in Indiana alone without any central control. In France this central control is regarded as of so much importance to the country that the roads and bridges are under a cabinet officer of the Nation, the Prefect of the Seine. In England they are under the charge of the General Governing Board at the head of which is an English nobleman who is proud to serve. An Englishman said to me: "I should think your people and especially your newspapers that exert such great power, would rise up against such obsolete methods." I told him it seemed hard to get them interested. He said that "good roads and their upkeep were more important than prize fights, and that the newspapers were interested in them."

2. The roads and their upkeep should be in the hands of some Central Bureau or Commission, like a Highway Commission, and the State should aid in the construction and maintenance of roads; uniform specifications and repairs are thus permitted.

3. The wood pavement was given the highest character where well constructed, not only in being quiet but in resisting heavy traffic.

4. Stone pavement is best for heavy traffic, where noise and comfort is of no consideration, as the cost of upkeep is the lowest;

5. Bituminous pavements, for moderate traffic where smooth surface and quiet is desired,

6. And most admirable for heavy country roads, etc.

7. Brick pavements were not mentioned, unless under the category of stone block pavements. There are none in London, Paris, Vienna or Berlin; only a few in Brussels, Amsterdam and Rotterdam; quite a few in the Hague, but even the Dutch engineers did not contend for them. It was quite a surprise to me.

8. Heavy flushing of streets with water was condemned; light sprinkling commended. Early morning cleaning and done quickly was urged.

9. Mechanical processes were particularly recommended.

10. Motor machines were recommended for cleaning and sprinkling in large cities.

11. A good deal of attention was given to stret railway tracks, urging puting them to the side of the street or road where possible and insistence on the tracks and pavement alongside being kept in good repair. There is no quibbling about this question in Europe; it is done.

12. Where electric lines are permitted to use the highways, they should be required to pave and keep the pavement in repair or have a separate space for the track above and at the side of the road.

13. Motor omnibuses were commended under proper regulation and the hope expressed that the service will be extended with lighter cars to the rural districts. Motor trucks on roads were regarded as a convenience and necessity and local communities were advised to test their bridges where the trucks are being used. It was recomended that their speed be not to exceed 25 kilometres (16 miles) per hour and that large and wide tires be used (sizes given). No ribbed or grooved tires should be permitted; no tree should be cut down where it can be avoided.

This will give a general idea of the subjects discussed and in a general way, the conclusions.

It seems that in America we are not alone in ultra- individualism. In other countries as well it seems that as soon as some engineers and officials come into office they become immediately self-sufficient, their ideas of engineering, of construction, of main-

tenance, are at once the best; things previous engineers and officials have done are bad, even the law must be changed to meet their ideas in many instances. It was urged by many delegates that the overwhelming authority of the eminent engineers and constructors of the civilized world might to some extent hold this aggressive quality in public officials in check in the interest of the tax payer, and besides, to the right-thinking official the conclusions expressed by such a Congress will be in the nature of standards that should not be departed from without just cause.

I need not dwell on the hospitable way in which the King, the Government of Belgium and the city of Brussels treated the delegates. A reception attended by the King and suite, several excursions and a banquet were among the entertainments.

The American Minister, Mr. Charles F. Bryan, gave an elegant dinner to the American delegates at his residence, which was much appreciated and enjoyed.

The Municipal Electric Lighting Plant at Richmond, Ind.

IN 1898, the dissatisfaction of the citizens of Richmond, Ind., with their existing electric lighting conditions, found expression in the the fact that municipal ownership was made the issue of a mayoralty election. The Richmond Light, Heat and Power Company furnished both gas and electric lights for the city and from various reasons seemed to favor gas as an illuminant. Their contract with the city for street lighting provided for not less than 150 arc lights at $90 apiece per year; and their rates to private consumers were 15 cents per kw. with no discount.

In 1901 bonds were voted and the plans of the municipal lighting plant were completed. The following spring the plant was completed and stood ready for operation with no customers and restrained from furnishing the city street lights by the fact that the private concern had a contract extending until 1904. The management of the plant was under control of the city council until the fall of 1902 when a commission of three was appointed to take charge. This commission operated the plant until 1905 when the state law provided for the control being held by the Board of Public Works, consisting of the mayor, the president of the board and the city engineer; making the control of the plant virtually in the hands of the mayor.

The cost of the plant complete in 1902 was $158,582, of which $144,000 was provided for by 4 per cent. bonds, payable in 1927, and the balance was advanced by the city. This cost was further increased each year by additional wiring, meters, etc., and in 1907 a new unit was added to provide for the increasing business. The first few years showed a loss due to the fact that the city was held to its lighting contract with the private concern and to the fact that additional equipment kept in advance of the receipts. Finally at the termination of the city's contract with the L., H. & P. Co., the municipal plant undertook the street lighting at a rate of $75.00 per arc, a decrease of $15.00 per year from the former rate. The rates for private consumers have been kept constant throughout and are as follows:

—Light Rates—

From 1 to 50 kw.....	9	Cents
" 51 to 200 kw.....	8	"
" 201 to 1,000 kw.....	7	"
" 1,001 and over.....	6	"

—Power Rates—

From 1 to 200 kw.....	6	Cents
" 201 to 1,000 kw.....	5	"
" 1,001 to 3,000 kw.....	4	"
" 3,001 to 5,000 kw.....	3	"
" 5,000 or more kw.....	2½	"

with a 20 per cent. discount for payment before the 10th of each month and a 50-cent minimum charge. No meter rent, nor deposit, nor charge for outside wiring is made. The city's 307 arc lights are now furnished at a cost of $43.85 apiece to the municipal lighting plant; while in the summer 47 additional lights are furnished for park use. The street arcs are operated all night throughout the year with no "moonlight" schedule.

The competition between the municipal plant and the Light, Heat and Power Company has been very keen. The L. H. & P. Co. tried by cutting their prices to meet the city's compe-

tition for private business, but the city refused to meet any such cuts. Of course some customers were lost by the procedure, but on the other hand many, through loyalty to the city, came voluntarily to the support of its plant. In 1907 the L., H. & P. Co. employed experts to investigate the books of the municipal plant and endeavored to prove to the citizens that the municipal ownership was a losing proposition. This investigation was followed by repeated efforts to buy the plant, but as the experts had failed to show a loss, the offers were refused. Even at the present time each prospective customer is solicited by representatives from both plants and each extension of service is hotly contested.

As will be seen from this table, the depreciation, on a 10 per cent. basis, is more than taken care of by the income from the street and public lighting taken year by year, though the total depreciation more than equals the income from such lighting up to the present time, owing to the three years when the streets were lighted by the private company at a cost of $90 per arc per annum.

At the present time the money advanced by the city, excluding the $144,000 bond issue, has more than been offset by the net earnings and with the present net earnings capacity of between $30,000 and $40,000 per year, it would not take long to provide for retiring the bonds and to start a sinking fund towards the cost of re-

Year Previous to	Receipts	Operating Expenses	Construction and Equipment	Receipts from Street and Park Lights	Advanced by the City	Paid to City	Depreciation
1902 ..	.....	.....	.....	.....	$158,582.29	.....	.....
1902 ..	$ 6,812.89	$11,472.80	$15,142.14	.....	21,341.05	.....	$ 15,858.22
1903 ..	28,997.91	30,360.67	17,615.22	.....	18,838.01	.....	15,786.62
1904 ..	38,064.10	30,415.26	18,498.44	.....	14,117.69	.....	15,969.48
1905 ..	56,257.78	31,330.41	12,739.80	$ 22,479.11	6,291.48	$18,887.57	16,222.37
1906 ..	63,188.78	33,587.03	12,959.18	22,659.94	.....	9,506.94	15,874.12
1907 ..	72,956.94	44,928.77	34,832.57	22,958.84	6,804.40	.....	15,582.62
1908 ..	75,694.64	44,022.33	12,069.74	23,171.04	.....	19,602.91	17,507.62
1909 ..	88,488.95	42,967.44	10,493.72	23,814.38	.....	35,027.79	16,963.79
				$115,083.31	$225,974.92	$83,025.21	$129,764.84

Advanced by the city...	225,974.92		
Less bonded indebtedness	144,000.00		
	$1,974.22	Depreciation	$129,764.84
Net earnings	$83,025.21	Income from Public Lighting	115,083.31
.. Net profit	$ 1,050.29		$ 14,681.53

REMARKS:—Previous to 1902 includes $144,000 of 4 per cent. bonds; 1902, no income from city lighting; 1906, $7,135.63 paid on permanent improvement; 1907, $22,931.15 paid on new power unit.

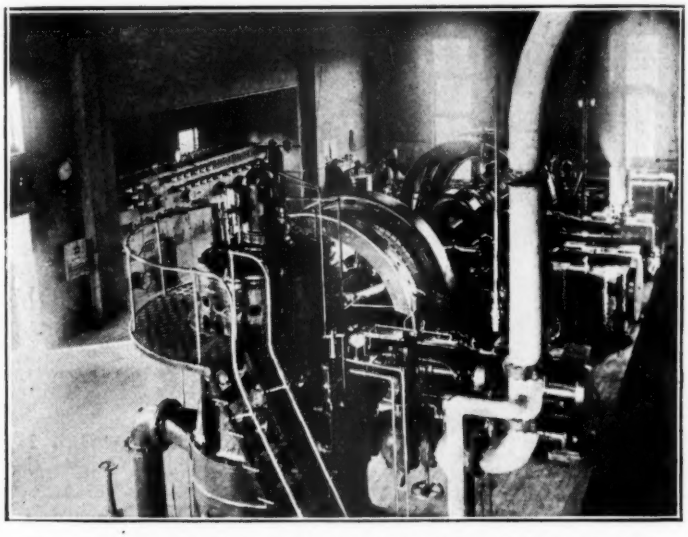
The progress of the municipal plant can perhaps best be shown by the above table computed from the reports of the superintendent. Column 2 of the table shows the gross receipts for each year; column 3 includes all operating expenses, salaries, coal, oil, repairs, bond interest and commission and miscellaneous; column 4 includes wire, poles, meters, transformers, new additions and extensions and sundry equipment; column 5 shows the amount paid by the city for street, park and public building lighting (Note: Previous to 1905 the private company furnished these lights, and during the present year, 1910, the lights are furnished free of charge to the city); column 6 includes all money advanced by the city on the lighting plant and equipment; column 7 shows the amounts repaid to the city by the lighting plant; and column 7 shows the depreciation costs figured at 10 per cent. of the cost of the plant with the addition of the new construction charge and less the depreciation charge for preceding year. producing the plant at the time such reproduction becomes necessary. It is not impossible, however, as the plant is entirely a municipal utility, that the consumers will insist upon a reduction of rates and thus reduce the earnings.

It will be noticed that the receipts of the company have shown a steady advance from the start. The monthly reports up to and including July of this year show a balance of over $19,000 in excess of the expenses, and the report for the month of June, which is usually the lightest month in the year, shows an excess of receipts over operating expenses of $4,792.40.

The last invoice gave the value of the plant and line equipment at $300,000, and it is the intention to add to this in 1911.

The power plant at present has three main generating units. The generating equipment consists of: one Curtis steam turbine, operating at 1,

I. MUNICIPAL ELECTRIC LIGHTING PLANT AT RICHMOND, IND.



II. ENGINE ROOM OF MUNICIPAL ELECTRIC LIGHT PLANT, RICHMOND, IND.

000 r. p. m.; a 500 kw. a. c. generator; one 650 h. p. cross compound Alfree engine directly connected to a 450-kw. a. c. generator; and one 450-h.p. cross compound Alfree engine directly connected to a 300-kw. a. c. generator. Both of the latter units operate at 150 r. p. m., and the three units are arranged to run singly or in multiple. For exciting the fields of the generators there are two 15-kw. d. c. generators direct connected to a 7x8-inch center crank Alfree engine running at 400 r. p. m. In addition to the machines there are one 100-kw. rotary converter and one 37.5-kw. rotary converter, besides condensers and feed-water pumps.

The switchboard equipment consists of 3 generator panels, 1 exciter panel, 3 feeder panels (with 2 lines per panel), 2 arc panels and 4 converter panels (2 a. c. and 2 d. c.). The whole switchboard equipment as well as the generator layout was manufactured by the General Electric Company.

The boiler room has 4 Sterling water tube boilers equipped with Roney stokers and the total power output is 1,240 h. p. The plant is taken care of and operated by 1 chief engineer, 3 engineers, 3 firemen, 1 brakeman, 1 laborer and 1 oiler. The total coal consumption is 8,000 tons per year of West Virginia coal; and the total output of the plant last year was 2,646,-670 kw. The accompanying photographs show the power plant and its generative equipment.

Everyone connected with the plant in any capacity is proud of its success and seems to feel a personal interest in its welfare. To this fact and to the principle of keeping the control of the plant and the employment of its men free from politics may be ascribed the success which it has achieved.

The Mill Creek Intercepting Sewer at Erie, Pa.

THE accompanying photographs show various stages in the construction of retaining walls and intercepting sewers along the banks of Mill Creek in Erie, Pa., in Section 1 of the work of improvement. This creek runs through the city from north to south, discharging into Erie harbor, Presqu' Isle Bay, near its mouth. It has a heavy fall down the slope of the hill and has cut down to the solid rock throughout.

The retaining wall is built on the solid rock, and the sewer is built in combination with it, as shown, so that where the grade of the sewer demands it the rock is excavated down to the sewer line. The flow line of the sewer is approximately parallel to the flow line of the creek, but occasionally an excavation of 6 feet or more below the bed of the creek was necessary to give approximate uniformity to the grade line of the sewer. The sudden and heavy floods in the creek made the rock excavation and the construction of the wall and sewer hazardous and rather expensive.

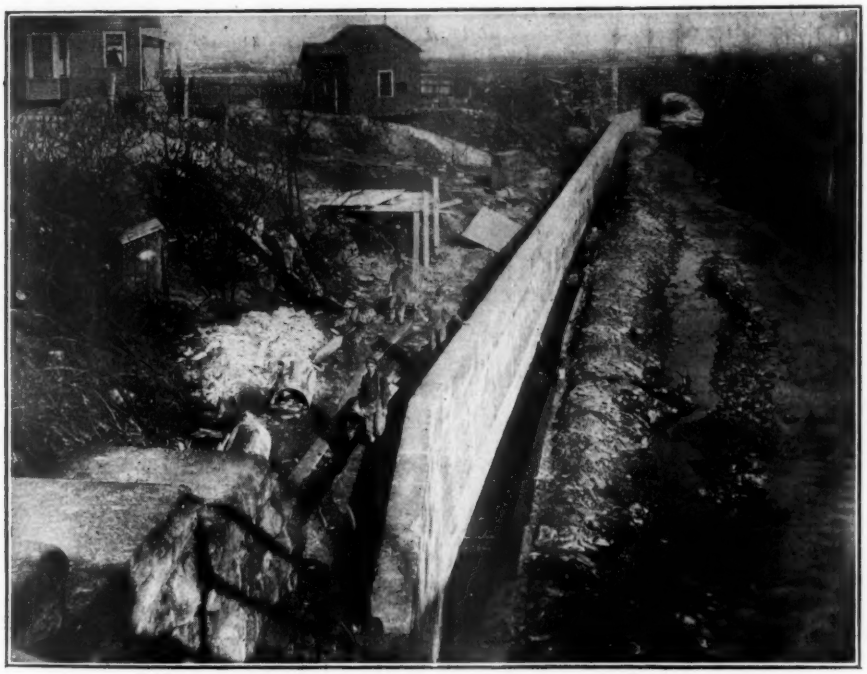
The wall in Section 1 as shown is about 10 feet high, 5.5 feet in width and 1600 feet long. The sewer shown in most of the photographs is 36 inches in diameter. The streets cross the creek on bridges some 25 feet above the intercepting sewer, so that all the sewers which have heretofore discharged directly into Mill Creek will now be intercepted and the ordinary flow of sewage will be carried off by the intercepting sewers on both sides of the creek, only excess of storm water escaping into the creek.

The second section of the work is 1200 feet of 36-inch vitrified pipe sewer in a cut averaging 17 feet in earth and rock.

A third section has 1220 feet of 24-inch vitrified pipe; the fourth section 2300 feet of 24, 20, 18 and 15-inch pipe; the fifth section 2300 feet of 12-inch pipe; the sixth section 5160 feet of 12-inch vitrified pipe. The total estimated cost of the sewer, 14065 feet long, is $38300. The wall is paid for at the rate of $5.50 a cubic yard of concrete, allowance being made for the space occupied by the sewer, and as it varies much in height, its cost can scarcely be ascertained until the work is all completed.

We are indebted to the Indianapolis office of the Lehigh Portland Cement Company for the photographs accompanying.

RETAINING WALLS AND INTERCEPTING SEWERS ALONG MILL CREEK, ERIE, PA.



RETAINING WALLS AND INTERCEPTING SEWERS ALONG MILL CREEK, ERIE, PA.

Bituminous Roads, Mixed and Poured*

By George C. Warren, President of Warren Brothers Company, Boston, Mass.

IN the year 1909 the New York Herald and Atlanta (Ga.) Journal offered premiums of $1,000 for the first; $500 for the second, and $250 for the third best section of country road between New York City and Atlanta, Georgia, one of the southern of the United States of America, covering a distance by air line of about 750 miles.

The first premium was awarded to Mercer county in the State of New Jersey, of which Frank I. Eppele is county engineer.

In an excellent paper on the subject of "Future Highway Improvement," published in a current paving journal, Mr. Eppele says:

"I think the statement can be made that already the problem has been solved in part and that road engineers have practically agreed that the principles of construction which provide for the broken stone or other road metal used to sustain the wear, and some bituminous product applied in conjunction with same, possessing in a high degree the necessary binding and dust preventive qualities, will be the basis for adoption of a method for future highway construction. If this be true, I think we can logically conclude that a majority of road engineers will favor a method of construction that insures a perfect coating of bituminous binder to every particle of road metal being used, and before same is spread upon the highway, to one that provides for the application of a binder to the surface of the material after same has been spread upon the work either by a method of pouring, sprinkling or spraying and then depending upon the penetration qualities of the binder to give a uniform and perfect condition of coated work. Were it not for the question of cost involved I am sure that a form of construction involving the use of a mechanically coated material, for at least the top course, or wearing surface of a road, would be adopted; but even taking into consideration this question of first cost, would not this increase be more than balanced by the condition of the roadway together with the wearing and other improved qualities of the same after construction?"

From an article in the same publication we extract the following:

"It is safe to say that a grouted road is not as satisfactory and long-lived as a mixed road. As the desirability of accurate proportions in a bituminous macadam is great the batch mixer will probably prove most satisfactory. The best results in Massachusetts have been obtained with broken trap rock 2½ inch to ½ inch in size, having 40 per cent. or less voids. If this percentage of voids is lessened by more small particles in the aggregate, say from 2½ inch to ¼ inch, still better results obtain. I believe that when a softer rock is used the slight crush which takes place during the construction draws in more bitumen and produces a denser pavement. Experiments have shown that bituminous surfaces having the voids filled with bitumen and trap pea-stone are to be preferred in every case.

"A mixture of 2½-in. to ½-in. trap stone with 40 per cent. ½-in. sand well mixed dry, and then coated with bitumen should prove to be a very permanent road matrix."

The question naturally arises: If a mineral aggregate varying from 2½-in. to ½-in., having 40 per cent. or less voids, is good, and if running the fineness of the stone down to ¼ inch is better, and if the voids are filled with sand, the mixture is still better, why should not the "ne plus ultra" be provided by going a little farther in the scaling down process as to sizes and using scientifically determined and accurately proportioned mineral aggregate down to the finest obtainable (impalpable powder) in which mixture the voids can be reduced as low as 10 per cent. and all the voids thoroughly filled?

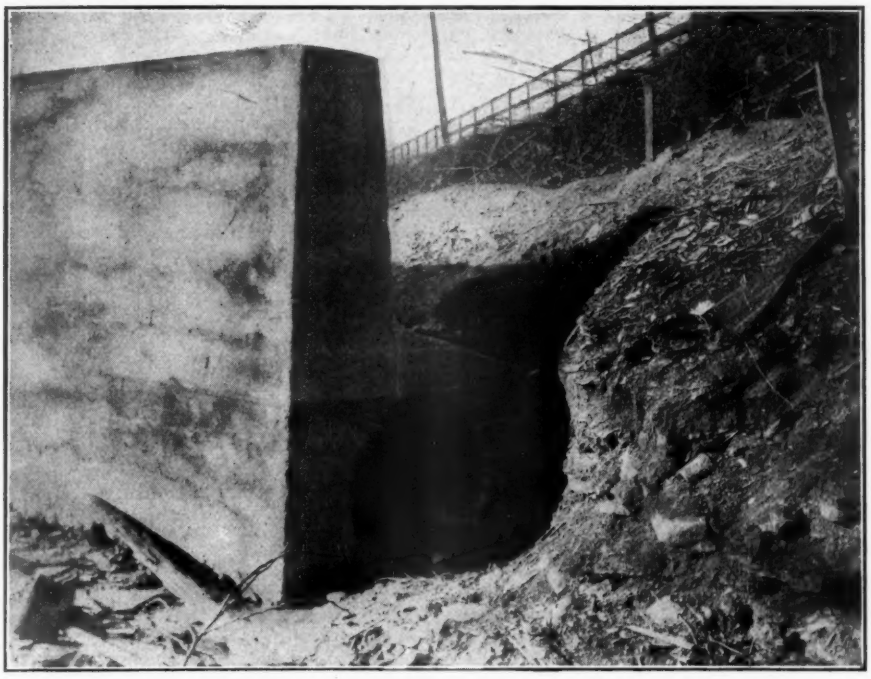
Turning to the subject of this paper, pouring or penetration methods have the following advantages:

a. Very little investment in plant.

b. The cheapest possible method of application.

The following are the disadvantages of the pouring methods:

*Written by request for presentation at the International Road Congress Brussels, Belgium.



RETAINING WALLS AND INTERCEPTING SEWERS ALONG MILL CREEK, ERIE, PA.

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a. After the stone is rolled the portions of the surfaces of many of the individual stones are in such contact with each other and many of the voids are so small that the bitumen cannot penetrate into many of the spaces, and consequently cannot thoroughly coat the particles of stone. This objection rapidly increases as the minimum size of the stone used and the voids decrease.

b. If the bitumen used is not hard enough and of a character sufficiently cementitious to bind the particles of stone together the road will gradually ravel if subjected to even a moderate traffic.

c. Unless enough bitumen is used to thoroughly fill the voids to the greatest extent practicable, the particles of aggregate are not even approximately bound together and satisfaction is only temporary.

d. If the voids are filled with bitumen as much as practicable, then the roadway has a surplus of bitumen, or rather it is not properly distributed through the mass, and the free and nearly pure bitumen in the large voids oozes to the surface under traffic during hot weather, making a sticky, unstable, and undesirable surface, which ruts and rolls badly under traffic.

Very good examples of the two last mentioned disadvantages and inherent weakness of construction are found on sections of Huntington avenue in Boston, Mass., which were laid under the most approved penetration methods during the summer of 1909. From the east side of Gainsboro street to the east side of Bryant street the spaces between the stones were filled very full with bituminous binder. To facilitate and make more thorough the filling of the voids the precaution was taken, after rolling the stone, of heating it with a large gasoline flame confined under a sheet-iron hood resting on the surface of the rolled stone. The apparatus used being that known in the asphalt paving business as "surface repair heater." Between east side of Bryant street and east side of Ruggles street less bitumen was used and consequently there were voids less thoroughly filled. In both sections bituminous cements were used of a grade of hardness which required heating to a temperature of about 275 degrees F. to liquify, and consequently they were cementitious and of the true binder class as distinguished from liquid oils and tars often called binders, although in the writer's judgment more properly classed as dust layers. Both sections presented a fine appearance during the summer and fall of 1909, the spring of 1910 and the intervening winter, except that in spots in both sections where the bitumen had not penetrated well into the surface, raveling began in the early spring. On June 13, 1910, on the section in which the voids in the stone were least filled, the bitumen has disappeared from over one-third of the surface and we have on such portions practically a macadam road (as if no bitumen had been used) which is already raveling and promises at an early date to require entire resurfacing. This section of the street shows great irregularity in amount of bitumen used, as there are many places from 2 ft. to 10 ft. in length where there is an excess of bitumen, which has been pumped by traffic to the surface and now is much too rich, showing deep calk marks and an unstable surface. On the section where the greater quantity of bitumen was used the surface is now so very soft that automobile and other vehicle wheels and horses' hoofs press into the nearly pure bitumen and unstable mineral aggregate at the surface to a depth of over half an inch and the surface presents a very sticky and undesirable condition. In describing the rutting and marking of vehicle wheels and horses' hoofs, reference is made to moving horses and vehicles in the center of the roadway and not to the still greater marking from standing vehicles and horses near the gutter.

The mixing methods are of two general classes as to hardness of bitumen, known as cold process and hot process, and two classes as to method of mixing known as hand mixing and machine mixing, which will be treated in the order named.

The cold process means the use of a mixture of stone and bitumen of such a character that the ingredients can be mixed and laid without artificial heat, that is, at the temperature of the air. This necessitates the use of bitumen of a character which is liquid when cold and, as above referred to in connection with penetration methods, is necessarily deficient in cementing strength, unless the bitumen is made liquid by the use of a volatile temporary liquifier which will evaporate soon after the roadway surface is laid. The cold process is also necessarily subject to the weakness that the moisture has not been evaporated from the aggregate

before adding the bitumen, which seems to be bad practice to say the least.

In the writer's judgment, other things being equal, the hot process gives the best results, but is necessarily more expensive, on account of the more or less expensive plant required to heat and mix the ingredients, but also on account of the greater amount of labor required to heat and roll the much tougher, denser and harder surface mixture. The hot process has the great advantage of providing a surface which is set hard as soon as compressed and chilled to the temperature of the air.

Hand mixtures have the following advantages over machine mixtures:

a. Comparatively little expense of plant installation, on account of which it is applicable for use on roadways of less area than practicable by machine methods.

b. No cost of fuel and consequent saving.

c. Some writers say machine mixing labor is less than hand mixing, but taking all items of cost, including plant installation and delivery of materials to and from the mixing plant, and labor of mixing and laying into consideration, the writer believes as a rule the reverse is the real condition.

The disadvantages of the hand mixing processes are.

a. Manifestly less thorough mixing and less accurate proportioning and uniform distribution of ingredients and consequently greater variableness of results than with a properly constructed mixing and heating plant.

b. Because of greater ease in hand mixing a marked tendency toward use of a softer bitumen.

c. Impracticability of getting a thorough mixture without more power than can be executed by hand if the combination of ingredients is as dense as it should be to produce the best results.

Machine mixing methods may be subdivided into several classes as follows:

First. Mixing without accurately proportioning or heating ingredients for which ordinary concrete mixers either of the continuous or batch types will answer. This method has the advantage of least expense in plant and labor, which in the writer's judgment is very much more than counterbalanced by the disadvantages of using bitumen of a grade so soft as to be liquid at normal temperature and of less accuracy and uniformity of results.

Second. Mixing by heating without accurately proportioning the ingredients, which in the writer's judgment is better than the last named method but still inherently defective.

Third. Using a well planned mixing and heating machine specially constructed for the purpose, which will produce the following essentials to a mixmum degree of success:

a. Uniformity and accuracy of proportioning of ingredients both as to varying sizes of mineral aggregate and amount of bitumen.

b. Sufficient heat in the ingredients when mixed and laid in the work to evaporate moisture and permit the use of bitumen hard enough to furnish a true binder.

c. When compressed in the work, a solid, dense, voidless, dry bituminous concrete wearing surface that will to the greatest possible extent prevent penetration of moisture (the enemy of all road surfaces) and withstand the troublesome automobile and other traffic without shifting or presenting undesirably soft surfaces.

A word here on the subject of proportioning of mineral aggregates in bituminous wearing surfaces may not be out of place. The writer believes from his wide experience and observation as well as from theoretical reasoning that the following are necessary essentials to the best construction.

First. That the sizes of stone or mixture of stone and sand composing the mineral aggregate of the wearing surface shall be scientifically and accurately proportioned varying from the coarsest size permitted by the thickness of the surface (at least one-half inch less than the depth of compressed surface desired) down to an impalpable powder, each size so proportioned as to reduce the voids to the greatest practicable extent, which in practical work can be as low as 10 to 15 per cent. of the volume. To practically produce this result a mixing plant designed to proportion and control the sizes of the aggregates is essential.

Second. That sufficient bitumen shall be used to thoroughly fill the remaining voids and evenly but thoroughly coat every particle of aggregate, large and small, with a thin coating of bituminous cement of a grade, which when cold provides a high degree of cementing strength, and solid construction of bituminous

concrete, which (as is practically possible) when thoroughly compressed on the road foundation, has the density and within about five per cent. of the specific gravity of solid rock of the character used in the wearing surface. This difference in specific gravity represents the difference between the specific gravity of the stone (say 2.8) and the bitumen (say 1.0-1.25) used in the construction, and not voids or lack of density or stability in the compressed bituminous concrete wearing surface.

Such a construction necessarily costs more than more or less makeshift substitutes, but in the writer's judgment, as a general proposition, the difference in cost is well expended and the cheaper processes will be found by practical experience to be the most expensive in the end. The writer believes that road surfaces made of mineral aggregate and bitumen are and will continue to be successes or failures in proportion as they accompiish or digress from these essentials to the best results.

These are basic principles embodied in the construction of the bitulithic pavement for city streets now in its tenth year of successful use.

Brick Highways in Ohio

THE success of Cuyahoga county in building brick roads during the past twelve or fourteen years has been so pronounced that the comparatively new State Highway Commission finds it possible to use brick on many of the roads which it builds. The cost of these state roads is divided between state and county according to methods prescribed in the law, which give ample opportunity for local option as to the amount and cost of work to be done. The results are of interest at this time.

In 1908 the contracts let by the state highway department included 7.17 miles of brick pavements, over 20 per cent. of the mileage of the year. In 1909 the mileage of brick pavement contracted for increased to 20.45 miles, which was nearly one-third of the mileage of the year. A similar progress is being made during the present year.

The state's brick pavements are ordinarily laid with concrete foundation and sand cushion costing about 88.2 cents a cubic yard, concrete curb costing about 25 cents a linear foot, brick surface costing about 80 cents a square yard, cement filler and tar expansion joints costing about 6 cents a square yard. Excavation costs 25 cents a cubic yard and gravel backing for the curbs costs 50 cents a cubic yard.

The accompanying photographs, for which we are indebted to James C. Wonders, State Highway Commissioner, show some of the recent work and methods used in construction.

The first photograph shows the East Avenue road in Goshen township, Tuscarawas county, which was let by contract for $17,137.12, and is 1.49 miles long, with roadbed 26 feet wide and brick surface 15 feet wide. The maximum grade was reduced from 3.7 to 1.1 per cent. The photograph shows the process of laying brick, which are delivered on a brick conveyor, thus saving manual labor, disturbance of the bricks after laying and time of the brick layers.

The second photograph shows the completed East Palestine road, Unity township, Columbiana county, except that the bermes have not yet been put in proper condition. This road has a gravel foundation and sand cushion costing about 20 cents a square yard. The contract price was $18,000 for 1.51 miles with roadbed 22 feet wide and brick surface 14 feet wide. The maximum grade of 6.5 per cent. was reduced to 4.1 per cent. by the improvement.

The third photograph shows a brick road on a gravel foundation, the Athens and Chauncey road, Athens and Dover townships, Athens county. The foundation and sand cushion cost about 25 cents a square yard and the brick surface about 64 cents. Sandstone curb was used. The road is 0.9 mile long, with roadbed 22 feet and brick surface 12 feet wide, and it cost $11,941.45. The maximum grade, of 10 per cent. before improvement, was reduced to 6 per cent.

The fourth photograph shows the Green Street road, Marietta township, Washington county, which is 1.14 miles long, has a roadbed 24 feet wide and brick surface 16 feet wide. The contract price for this road was $15,490. Part of the concrete curb on this road was flush with the brick and part was raised. The latter cost a trifle more

1. OHIO STATE HIGHWAYS.
Brick Pavement on East Avenue Road, Tuscarawas County.

than the former. The maximum grade of 8.5 per cent. was reduced to 5 per cent. The photograph shows the concrete curbs completed and forms removed, some of the form boards lying in the foreground. The brick are piled along the curb to be laid as soon as the foundation is completed.

It will be noted that these roads differ in some respects from the later Cuyahoga county roads in that they have a crown in the center, instead of plane surfaces sloping from one curb to the other; and that they are laid approximately in the center of the roadbed, instead of giving all the space for vehicle traffic on the unpaved portion of the roadbed on one side of the pavement.

The Municipal Water Works of Mattoon, Ill.

MATTOON, a town of 15,000 population, was in 1905 brought to face a question which not only concerned the welfare of the city, but in fact placed at stake its whole industrial future. The shops of the Big Four railroad company are located at Mattoon and, though not the sole employer of labor, these shops were the largest single factor in the labor employment field. At this time some improvements in the shops were contemplated and the Big Four refused to go ahead with these improvements and in fact threatened to move their shops unless the city would guarantee them all the water they wished to use. Previous to this time the Mattoon Clear Water Company was furnishing water from subterranean wells and their capacity was only 1,000,000 gallons per day during their best season of the year, while at times their supply was as low as 500,000 gallons per day. The total quantity of water needed for the Big Four and other commercial lines was 1,500,000 gallons per day.

After a consideration of the question in all its phases and weighing carefully all the solutions of the problem, a system was decided on and built, consisting of an impounding reservoir and a service reservoir with the necessary pumping equipment. The impounding reservoir is situated about five miles from town and was constructed by building an earth dam with a concrete spillway and a 4-foot concrete core wall, across a stream draining a large area of farm land. The reservoir has a capacity of 200,000,000 gallons. At the upper end of the reservoir, about one mile from the dam, a pumping station was built. The equipment of this station consists of two 1,000,000-gallon per day pumps of the duplex compound type, manufactured by Fairbanks, Morse & Co.

From this station the water is pumped through a 12-inch cast iron main to the summit of a hill about two and one-half miles from the station. From here gravity flow carries the water through an 18-inch vitrified pipe to the receiving reservoir. The vitrified pipe was laid with tightly sealed cement joints. At points along the line of vitrified pipe, farm drains are connected and add their flow to that from the reservoir.

The service reservoir is built of waterproofed concrete and has a capacity of 1,500,000 gallons or one day's supply at the present rate of consumption. The equipment of the pumping station at this point consists of two 1,000,000-gallon high-duty pumps of the same manufacture as those at the impounding reservoir.

At present the water from this system is fit only for commercial purposes, but a filter system could readily be installed.

At the present time about 750,000 gallons per day is pumped from the service reservoir, and of this amount the Big Four uses 500,000 gallons and the Illinois Central uses 100,000 gallons. The monthly income from consumers is about $1100.

The water is said to be of excellent properties for boiler use. Following is an analysis of its chemical properties stated in parts per million:

Alkalinity (as $CaCO_3$)	203
Chlorine	8
Magnesium (as $CaCO_3$)	113
Incrustants (as $CaCO_3$)	54
Total Solids	298
Free Carbonic Acid (CO_2)	12

The costs of constructing the system were brought down to a minimum by the use of labor-saving devices throughout. Wheel scrapers were used to carry the clay material for the selected fill of the dam from a distance of about 1000 feet. Slips were used to convey the ordinary earth fill from the lower

2. OHIO STATE HIGHWAYS.
Brick Pavement on East Palestine Road, Columbiana County.

side of the dam. The concrete for the spillway was machine mixed on a platform over the forms and was dropped into wheelbarrows and wheeled into place. The trenching was done with a Chicago trenching machine and slips were used in backfilling. The cost of the plant at present is given as follows:

Land	$18,583.42
Dam and reservoir	38,803.69
Buildings	5,221.75
Machinery	10,975.65
Pipe lines and conduits	42,950.91
Total	$116,535.42

M. C. L. Jones, city engineer of Mattoon, superintended the construction of the system. Prof. A. N. Talbot was consulting engineer.

A description of the plant of the Mattoon Clear Water Company, which furnishes the domestic water supply for the city, will be found in MUNICIPAL ENGINEERING, vol. xxxviii, p. 402.

London and Glasgow Main Drainage

By a Special Correspondent

THE steady increase in the population of London and the continual requests from outlying districts to discharge sewage into the main sewers made it clear some years since that it would be necessary to extend the scheme of intercepting sewers formulated by Sir Joseph Bazalgette forty years ago, and in 1899 the London county council decided to construct a considerable number of additional sewers.

The extension works which have been completed or are now being carried out, include, on the north side of the Thames, two new outfall sewers, each 9 ft. by 9 ft., which are now in use, as well as the three previously existing lines of similar sewers: a new "Middle Level" sewer from Willesden to Old Ford some 9 miles in length, which is also in use; and a sewer known as the "Northern Low Level No. 2," which extends from Hammersmith to the Abbey Mills pumping station at Stratford, a distance of nearly 13 miles, of which parts are now under construction. In view of the large additional quantities of sewage and storm water which, when completed, the last sewer will deliver at Abbey Mills pumping station, and because the existing pumping plant at Abbey Mills is already severely taxed during storms, it has decided to erect at this station, on ground adjacent to the existing engine houses, a new engine house with powerful pumping plant.

The water lifted by this new plant will be discharged either into the high-level outfall sewers already referred to or under the powers reserved to the council by its General Powers Act of 1909, into the branches of the River Lea.

The building work is now in progress. The pumping plant about to be erected in this new station will be generally similar to that in the council's other storm-water pumping stations. As in the case of those stations, the new plant will generally work during rainstorms only, and in consequence it will be operated from 60 or 70 hours up to, say 200 hours in each year, according to the number and magnitude of storms which may have to be dealt with.

As an indication of the enormous damage that may be done by flooding during a severe storm—damage which it is hoped to reduce very materially if not to obviate entirely, by means of these storm-water stations—it may be recalled that on July 23, 1903, no less than 2.97 inches and 3.59 of rain were recorded in the course of 24 hours at Deptford and Abbey Mills pumping stations respectively, and that, notwithstanding the extensive storm relief works then in existence, many places were flooded that had never before been so affected, and over 1,000 complaints were received from borough councils and private persons. It will therefore be apparent that these storm relief plants are required to deal with sudden emergencies, and that if they are to be of service it must be possible to get all the pumps into full operation in the course of a few minutes.

In the old station at the Isle of Dogs the motive power is steam, and in order that power may be always available at very short notice, the boiler fires are kept "banked" night and day,

Sundays and week-days; but in the more modern stations gas-engines have been provided so that the expense of maintaining "banked" fires may be avoided. The fuel employed is town's gas, as, although producer gas would be cheaper, the producers would also require to stand continually with "banked" fires. In view of the short periods during which the plants are at work, the extra cost of town's gas is negligible.

The new enginehouse at Abbey Mills is 180 ft. long by 42 ft. wide, and will contain seven centrifugal pumps with suction and delivery pipes of 38 in. diameter capable of dealing with a total of 150,000 gals. per minute. Each pump will be direct coupled to a vertical gas-engine having four cylinders over four cranks. The cylinders are 21 in. diameter by 24 in. stroke; the engines are designed to develop 475 b. h. p. at 180 r. p. m., and are fitted with piston rods, cross-heads, and guides as in steam practice. The cylinders and exhaust valves will be cooled by water circulated from seven vertical cylindrical tanks (each 11 ft. diameter by 24 ft. high) by small centrifugal pumps driven from the main engine shafts. The cylinders are also provided with water injection, and forced lubrication is fitted throughout. Starting will be effected by compressed air at 200 lb. pressure supplied by two compressors driven by separate steam engines, and stored in four tanks each 3 ft. 3 in. diameter by 10 ft. high. A 15-ton hand operated overhead crane will be available throughout the length of the building.

In ordinary circumstances the plant will pump the storm water from the low-level sewers entering the station to the high-level ones which pass close to it—a difference in level of about 40 ft.; but an alternative outlet to Channelsea river is provided for use in the case of exceptionally severe storms when the high-level sewers would be surcharged and unable to take the water. The admission of water from the low-level sewers is controlled by four hydraulically worked penstocks, two being 7 ft. 6 in. in diameter and the other two measuring 6 ft. by 5 ft. 6 in. It is hoped that the roof of the building will be erected by next spring, and that at least two or three

3. OHIO STATE HIGHWAYS.

Brick Pavement on Athens and Chauncey Road, Athens County.

of the pumps will be ready for work during the summer storms of next year. The first gas-engine is now approaching completion, and will probably be tested at the maker's works in October next.

GLASGOW SEWERAGE.

The inauguration of the Southern districts sewage works on May 2, marked the completion of the Glasgow sewage purification scheme. Next to the undertaking of the London County Council the Glasgow scheme is the largest in the world. It has cost nearly $12,000,000 and taken twenty years to carry out. The territory stretches along both banks of the river Clyde for about fifteen miles, the superficial area being fully forty square miles. The completion of the scheme removes from the Clyde sewage of Glasgow and the adjacent burghs to the end that the Clyde shall once more become a clean river and a resort of the salmon. Prior to 1894, the whole of the Glasgow sewage was discharged without any purification into the Clyde.

The volume of sewage and the proportion of rainfall to be dealt with is estimated at 250,000,000 gallons per day. The drainage area is divided into three sections with separate works for the disposal of their sewage. The principle upon which the whole scheme is based is that of intercepting all the sewage in the ordinary sewers by means of special sewers and then leading these to one or another of the three purification works.

On May 2, as I have said, the finishing touch to the whole scheme was put

4. OHIO STATE HIGHWAYS.
Brick Pavement on Green Street Road, Washington County.

by the opening of the new pumping station at Kinning Park. Great difficulties were experienced in finding a site for this station, and when these were overcome it was found there were many difficulties in connection with finding good strong strata.

The pumping machinery raises the sewage from the intercepting sewer in St. James street and delivers it through two rising mains, each about three-eighths of a mile in length, into the main outfall sewer in St. Andrew's Drive. The net lift or head to be overcome is about 39.5 feet, and the resistance of friction of the rising main raises the total head to an equivalent of 46 to 48 feet. There are three main pumping engines, and every provision is made to receive a fourth engine with the least practicable trouble, and without disturbing the work of the pumps now erected. Two pumps are intended to deal with the present wet weather flow of sewage, the third being generally at rest as a stand-by, to allow for pump cleaning, adjustments and repairs. The greater part of the auxiliary machinery is driven electrically by current taken from the mains of the corporation.

The sewage enters the station through a penstock, 7 feet 6 inches in diameter, and passes first into a catch-pit, which is provided with a traveling grab-dredger, to lift the heavy grit and sand which are washed into the sewers from the streets. Turning at right angles from the catch-pit it enters three screening channels, each of which is guarded by an open bar gate or rough screen (to stop larger floating bodies), a penstock, and two fine screens of the lifting-gate type. The spaces between the bars of these fine screens are three-fourths of an inch wide. Having been screened, the sewage flows by distributing channels into the pump wells, which are separate for each pump, and each well can be isolated by its own penstock, for cleansing purposes.

In order to economize space and to leave some yard area in the station, the catch-pit chamber and the screening chamber are entirely below yard level. A small elevator raises the spoil from the catch-pit and from the screens to the higher level, that it may be carted away or burned.

The bottom of the pump wells is about 40 feet below street level, and the invert of the catch-pit 6 feet lower. The pumps are placed on heavy beams directly over the pump wells and the engines on similar beams at about street level. The former are of the triple-plunger type and the latter of the vertical triple-expansion marine type. The cylinder piston rods are directly connected to the plungers. Each engine and pump at normal full speed will raise 12,320 gallons, or 58 tons of sewage per minute. The surface condenser of each engine is placed on the delivery pipe of the pump, and all the sewage passes through the condenser tubes on its way to the rising main. Each pumping engine can be isolated from the main by means of a sluice valve on its delivery branch. Connecting pipes and additional sluices permit of any pump delivering into either of the two rising mains. Air vessels of liberal capacity are placed on the delivery pipes and on the pumps themselves, to steady the flow of sewage and to resist the effects of shocks which are liable to occur in the event of sudden stoppage and reversal of the stream in the rising mains.

The whole area of the pump-house is commanded by an electrically driven traveling crane capable of lifting the heaviest parts of the machinery. There are in the boiler house three water-tube boilers, with every provision for a fourth. One boiler is intended to provide steam for one pumping engine. The boilers are strong enough for 200-pound pressure, and steam is generated to a pressure of 180 pounds per square inch with a moderate degree of superheat. The steam pipes are of wrought steel, the feed pipes of copper and gun metal. Underfeed stokers are fitted to prevent smoke. There is a lightly forced draught below the grates and a liberal chimney to draw off the waste gases after they have circulated about the tubes of a feed-water heater or "fuel economizer." Duplicate pumps are provided for feeding the boilers from a feed tank which contains oil filters, and additional filters are fitted on the feed mains.

The Classification and Filing of Technical Memoranda

By Henry C. Adams, Assoc. M. Inst. C. E., A. M. Mech. E., A. M. I. E. E., London, Eng.

THE subject of classifying and filing the odds and ends of information which an engineer is constantly collecting is one which has received considerable attention in recent years, both in this country and in America, and the importance of obtaining and using a thoroughly sound system is generally admitted. The ideal system demands that all the information on any point must be collected in one place; it must be capable of easy expansion; it must be so elaborate that there is no doubt as to the probable whereabouts of any particular detail, and yet so restricted that expeditious reference is easy; it must be economical in first cost, and economical in working; that is to say, the time occupied in classifying, sorting, putting away papers, and getting them out again when necessary must be reduced to the lowest limit.

The matter to be dealt with in the filing system should be limited to small pamphlets, leaflets, newspaper cuttings, etc., leaving the larger pamphlets and bound catalogues to be dealt with separately, and it must be remembered that the matter to be filed comprises papers of every conceivable shape and size.

Every new departure, invention or improvement is generally first announced through the medium of advertisements, and an engineer must study them to keep in the forefront of progress. Items worthy of preservation are often found in the advertising pages of the technical journals, and surely the advertiser's highest ambition is attained when his insertions are cut out and preserved for future reference by those whose attention he wishes to attract. Many advertisers fail to recognize that an insertion which merely advertises the maker's name and includes a photographic reproduction of a machine or article to a microscopic scale is generally valueless to an engineer, although it may appeal to the man in the street. An engineer has so much valuable material to his hand at the present day that he can find no room to collect information which can probably be found equally well in a trades directory. It is problematical whether there is any truth in the suggestion that the majority of engineers were directed into the profession because of their uncontrollable desire in the days of their childhood to see the inside of things, and ascertain the nature of the construction and motive power of their toys, but there is no doubt that in after years such a desire must be strongly developed if an engineer is to become a master of his profession.

The essentials of an advertisement, therefore, should consist primarily of sectional details to show the general construction of the article, and to explain the method of its working; secondly, a photographic reproduction, to a reasonably large scale, of the exterior view of the article, and, finally, of a brief, pointed, technical description, in ordinary "long primer" type, of its special advantages, and the main points wherein it differs from similar articles made by other firms, omitting all those generalities to which the thing must obviously, by its very nature, conform. The name and address of advertiser, with name and date of periodical, complete all that is necessary, and the whole should occupy as compact a space as possible. If the advertiser wishes to have a whole page advertisement, let the essential part, as outlined above, be printed in one corner. The remainder of the page can be left blank, or carry some special mark to attract the desired attention according to the advertiser's taste; it is immaterial to the engineer.

Probably very few of the circulars and smaller catalogues which occupy so much space in the post-bag each day are preserved by the recipients, because of the difficulty of knowing how to deal with them. In one case a pamphlet of several pages may be used to convey information which could better be given on one sheet, and housing room is grudged for unnecessary paper. In another case one sheet of paper may bear advertisements of nearly every line followed by the merchant, from nails to locomotives. Then there is the booklet which would be very convenient for carrying in a waistcoat pocket if one wished, but usually one does not; and at the other extreme are the placards which cannot be opened out until a desk is cleared. Finally, there are the books which are sent out

bearing the label "Please hang this up." If the advice were followed in all cases, the condition of the office walls would soon remind one of the recently suggested method of reinforcing concrete by mixing tenpenny nails with the aggregate, and it is probable that the decorative effect might leave something to be desired.

For convenience in filing, it is requisite that each line or subsidiary branch of the firm's products should be dealt with in a separate catalogue or pamphlet, or on a separate page, all publications being of one standard size, and that when leaflets are used each sheet should contain complete information about one article, and one only. The question of what should be kept or discarded depends upon the extent of the ramifications of one's practice, and also upon the depth of knowledge possessed in the various branches. As knowledge increases, many of the notes which were of service in less experienced days can be removed and destroyed; it is, however, rarely desirable to preserve items of only passing interest.

The writer has at different times tried many systems which it is needless to describe, as they were each discarded in turn because they failed to satisfy in practice the requirements demanded of them. The index must be arranged on a subject basis, but it is obviously impracticable to index every separate piece of paper. The successful working of the system hereafter explained depends upon the skill displayed in drawing up and from time to time elaborating the index. The index adopted by the writer's firm is arranged in sections under headings representative of the main branches, each section being subdivided to deal with the secondary branches, which are in turn divided up to the extent necessary to deal with specific details, and a number is allotted to each entry in the index. The following extract from the index itself will show its comprehensive range, and at the same time the extent to which detail matter is separately included:

INDEX.

ADMINISTRATION.

1 Office requisites. 1A Instruments. 1B Slide rules and calculating machines.
2 Office furniture.
3 Printing and lithography. 3A Photo-printing.
4 Tracing, professional assistance, translations.

AGRICULTURE.

8 Agricultural notes. 8A Farming tenancies.
9 Farm buildings, stables, horses, alphabetical order down to cowhouses, carting.
Etc., etc., in alphabetical order down to

WATER SUPPLY AND HYDRAULICS.

250 General notes on water supply.
251 Water charges, regulations, and forms.
252 Discharge of pipes and weirs.
253 Water softening and hardening. Lead poisoning.
254 Purification and filtration of water.
255 Distribution of water, meters, domestic supply. 255A Water supply fittings.
256 Wells, boreholes and pumps.
257 Impounding reservoirs. 257A Reservoir and barrage dams. 257B Gathering grounds.
258 Utilization of water power. 258A Water wheels, turbines, etc.

It will be noticed that in some cases two or more important subjects are coupled together under one heading, when at first sight it would appear to have been better to separate them, but the reason for this is that a large proportion of the notes collected on one subject are found to contain information relative to the other, and therefore to avoid a lot of cross-referencing they have been grouped together. For example, tramways and railways have a connecting link in light railways, which may be passenger tramways or heavy goods railways. On the other hand, some minor details acquire prominence by having a special entry allotted to them, the reason being that they have been crowded out from association with more important papers. The aim throughout has been to make the system fit the needs, and not to adhere slavishly to any preconceived idea of order and regularity.

All papers are kept loosely in strong cardboard boxes, specially made for the purpose by the Cardboard Box Company, Florence street, Birmingham. These boxes are 9 by 13½ inches and have both the lid and the box three-fourths of an inch deep; a length of red tape to tie at the edge, fastened safely to the box, is provided for keeping them closed. The boxes can stand on edge in rows on the bookshelves, and should have their distinguishing number stencilled on the exposed edges. They have a neat appearance, can be picked out without trouble, and are easily dusted. The method of fastening might be improved, and a spring clip inside would be useful, but the boxes have the merit of cheapness,

costing in their present form less than 1½d. each. A supply of stout, clean, bright-colored foolscap paper completes the outfit.

The method of working can be best explained by taking an actual example, say reinforced concrete (No. 185). When this subject was first introduced, the notes upon it were not numerous, and were put haphazard into the box. Soon the notes accumulated sufficiently to make it desirable to sort them; this was done under sections relating to floors, bridges, chimneys, jetties, etc., and as the total number was not more than enough to fill the box they were replaced, but each branch was separated by a piece of the colored foolscap paper, bearing the distinguishing number 185A, B, C, and D, respectively. In the course of time the matter collected increased to such an extent that one box would not hold it all, when one or more sections were removed bodily into separate boxes, which were marked with the distinguishing numbers of the sections concerned. The other sections remained in the original box, so that if 185C was wanted, and on examining the shelves it was found that there was no box bearing that number, it was known that the matter was not very bulky, and would be found in box 185. If at any time a box bearing a letter as well as a number required subdividing it could easily be done, using figures as 185A1, 185A2, and so on.

When a sufficient number of papers deemed worthy of preservation have accumulated in the office a senior assistant rapidly glances through each one to ascertain its character, and marks it with the number of the box to which it should go. The papers are then handed over to a junior, who sorts and places them in their respective boxes. Although the proposed method does not in any way depend on the possession of a good memory for its successful working, still, after a very short time, the various headings, and even the numbers, easily become impressed upon one's mind, thus facilitating the marking of papers. Each piece of paper being loose, can easily be taken out when required for any special purpose, and when it is finished with, the box in which it should be replaced it is at once seen by reference to the number which was marked on the paper when it was put away originally. Specific cases may be adduced to which the foregoing observations do not wholly apply, but it will probably be easy to suggest modifications to suit varying circumstances.—*Surveying and the Civil Engineer.*

The New Gravity Water Supply for Pulaski, Va.

By G. H. Derrick, M. Am. Soc. C. E., Pulaski, Va.

DURING the summer of 1908 the town of Pulaski, Va., had an epidemic of typhoid fever, which was traced to their water supply, consisting of five wells situated in a flat near a branch about one mile northeast of the town. The branch runs through a farming section, and the formation is limestone. After extended examination, it was decided to install a storage gravity system. A water shed of 1,740 acres lying on the north side of Drapers' Mountain, and some three miles southwest from town, formation sandstone, practically uncultivated, was acquired and will be inclosed. The impounding lake covers thirteen acres and holds forty-four million gallons. Fifteen thousand feet of 12-inch cast iron pipe has been laid, having a head of 216 feet above lowest part of town. The reinforced concrete dam is 151 feet from spillway to spillway and 37.6 feet high at lowest point. The spillways on each side are 20 feet wide and 30 feet deep, cut into hillsides and surfaced with concrete for 25 feet; side walls extend same distance below dam and are 3 feet high, providing against any overflow at crest of dam. Buttresses, 1:3:6 concrete, are spaced 10 feet centers, 12 inches thick at top and 18 inches at lowest point, having footings 2½ feet wide and into solid rock. The deck, 1:2:4 concrete, is 13 inches thick at top, and about 20 inches at base, with a cut-off wall 3 feet 9 inches wide, and extending into solid sandstone. Face of deck has a batter of 10 inches to the foot, and the buttresses batter 2 inches in 1 foot down stream. The crest is 18 inches thick and 2 feet 3 inches wide on top. The deck is reinforced with ⅞-inch square horizontal bars, spaced 4 to 8-inch centers,

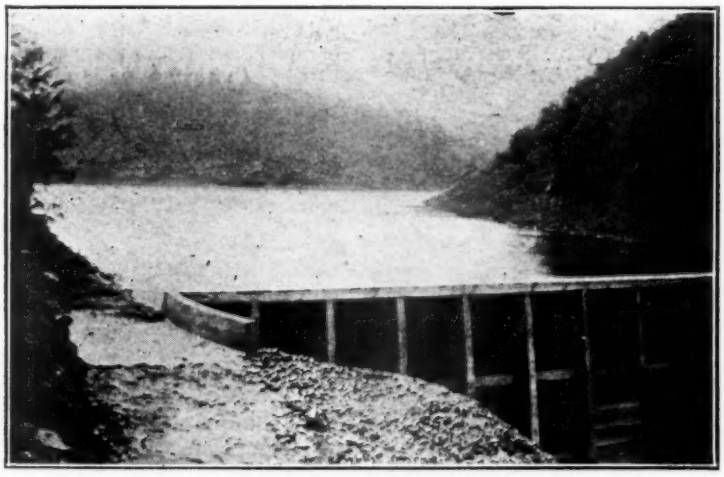
crossed every 2 feet with ½-inch square medium steel Havemeyer bars, clamped at intersection with the "National Chair." Five feet of wire cloth, 3x6, No. 9, was placed near the surface at the top, and two sections of 20-pound T-rail were also placed near the two top edges. One coat of No. 60 Elaterite water-proofing was used on surface of deck. The dam was designed so that an addition of 9.6 feet could be made, giving a reservoir capacity of eighty million gallons. There are three intakes of 12-inch flange pipe, fitted with flap gates worked from underneath deck, and covered with 2-foot square brass screens set on concrete. The pipes are strapped to side of buttress and pass into a 1½x4-foot intake well with cast iron top. A screen is in center of well and a 6-inch blow-off is for removing sediment. Four additional valves regulate intakes. A 24-inch cast iron pipe is located in bottom on opposite side of chamber, having a sluice gate and extra valve connection, all operated from underneath deck.

About twenty-one tons of reinforcement and 1,000 barrels of Old Dominion cement were used, 1:2:4 concrete, 370 cubic yards, and 1:3:6 concrete, 335 cubic yards.

The lump sum contract price for building dam and laying pipe line (the town furnished, f. o. b. Pulaski, all pipe, specials and fillings at dam) was $15,520. Cost was estimated as about equally divided between dam and pipe line. Material outside of contract cost about $15,000, and the water shed and other expenses made the whole project run something over $40,000.

Contractors, Lowe & Shoecraft, Bristol, Tenn. Engineer, G. H. Derrick, M. Am. Soc. C. E., Pulaski, Va.

The town began using the water on May 10, and within thirty days the dam was running over spillways, and on August 20 the water was 2 feet below the spillways.



REINFORCED CONCRETE DAM, PULASKI, VA., WATER WORKS.

Municipal Improvements in Richmond, Ind.

IF the municipal improvements of Richmond, Ind., are a true indication of her financial condition, then her boastful nickname "The Panic Proof City" is well applied. The streets are all broad, well paved and clean, and in most of the town are arched by trees that are a noticeable feature of the city. The streets are designated by letters, beginning at Main street and running north and south; and by numbers running east and west from the river. The street signs are of brass letters placed in the sidewalks on alternate corners of the street; the old system was that of the metal signs placed on posts. These latter are rusted so as to be very indistinct, and the former are, like most of that type of street sign, difficult to see from a passing vehicle or street car.

Parks.—Richmond maintains a park system that is worthy of note. The largest park is known as Glen Miller Park and includes about 160 acres, at the eastern limits of the city. This park is left almost in its natural state of wild beauty in the eastern half, while the western portion has been improved by drives, bridges across the small stream flowing through the park, and a small reservoir. In the improved part are pavilions, barns, sheds and shelters for the animals, of which there are several of the wild species native to this region. The smaller parks are of the usual type to be found in a city of this size. The acreage of parks is:

	Acres.
Glen Miller Park.....	161.0
South Seventh Street Park.....	2.6
South Tenth Street Park.....	2.19
Starr Park	1.14
Riverside Park (most of this ground recently purchased)..	4.
Total	170.93

In addition to these parks, the school department maintains a playground which is valued at $10,000, including improvements and equipment.

Sewage Disposal.—The sewage disposal plant is located about two miles west of the city, on ground owned by Earlham College. The plant consists of a settling tank discharging by siphons alternately into four contact beds. The settling tank consists of a 10x10-foot grit chamber and four 22x20x6-foot settling chambers with center baffle walls. In the last chamber are four 12-inch siphons set to operate alternately. The tanks are of waterproofed concrete of monolithic construction, and the tank walls form the walls of the building, which is closely sheathed and roofed in. The contact beds consist of 3 feet of gravel underlaid by 4-inch drain tile and are 50x100 feet in size. Each is used on the average of two times a day.

Garbage Disposal.—The city garbage is collected in five water-tight wooden wagons and hauled to the crematory on the river bank. Four of these wagons have regular routes, while the fifth is held for the purpose of making "emergency" calls. The crematory is a frame, corrugated iron building covering the oven. The single oven is of 11 yards capacity and is designed to take care of both wet and dry garbage. No attempt is made to separate the materials further than to pick out the cookies, crackers, good fruit, etc. This material is used to feed the animals at the Glen Miller Park menagerie. The ash, after having the stones, glass and tin picked out, is used in constructing a driveway down the bluff to the crematory and power plant. The capacity of the crematory is insufficient to take care of all the garbage during the summer months, so that about one-third of that collected is disposed of in the old manner by dumping in the country.

Street Lighting.—The streets are lighted by arc lights placed at every street intersection in the business and more thickly settled residence district. The dense, heavy foliage of the trees makes the lighting seem inadequate, though it is better, perhaps, than most cities of the same size. The arcs are operated by the municipal lighting plant at a cost of $43.85 apiece a year, including current and trimming. However, no rental is paid by the city, as the private service of the company more than pays for the street lighting at the present time.

Electrolysis.—The Indianapolis-Richmond interurban line and the Richmond city traction lines maintain their rail bonding in fair condition. But the Dayton-Richmond return circuit is said to be in poor condition. Considerable trouble has been reported from electrolysis, but no tests are made by either the city or the water works department, and no steps have been taken to lessen the trouble, other than to bond the water mains to the negative bus bar at the power station.

At first impression Richmond seems to be merely an overgrown country town, an impression gathered, perhaps, from the broad streets and the customary Main street with its comparatively narrow stone or concrete sidewalks and its street car line operating tiny cars at infrequent intervals. This first impression, however, meets with a radical change when inquiry is made into the management of municipal affairs. The system of management of municipal affairs is excellent. Party feeling is very radical in the city, yet in the control of such departments as the municipal lighting plant, the city engineer's office or any other department requiring personal ability, the question of party or politics is not allowed to enter. To this fact and to the excellent system of office management, as perhaps is best shown in the system of office records and accounting in the city engineer's office, may be attributed the present progressive condition of Richmond, the municipality.

More detailed descriptions of the electric lighting plant, the special forms of street construction and the water works will be found elsewhere in MUNICIPAL ENGINEERING in both past and future numbers.

A Sand and Gravel Plant

IMPROVING the highways is largely a local problem. Numerous investigations are being conducted for ascertaining and determining the most practical and economical methods of improving roads. The various results are exceedingly interesting and differ according to the existing conditions.

In the early extensive road improvement in the central and southern parts of the western half of Ohio gravel was used for the wearing surface. This early work was practically confined to the region where an abundance of gravel is found. The highways in and around Columbus have been improved rapidly in the past few years in a similar manner. The foundation bed in practically every instance is very hard stone and the wearing surface is gravel. The use of the stone is due to the extensive gravel formation in the western part of Columbus and vicinity, although strata of solid limestone and granite also occur.

In the Scioto valley, in which Columbus is located, large areas are made up of alternating strata of sand and gravel. The latter is abundant in sizes grading downward from pieces as large as an egg. Most of it consists of flint, extremely hard granite and limestone, and many small boulders form a part of the deposits. These deposits were brought down by glaciers, the water from which carried large masses of debris, such as sand and gravel, and in the course of time these were deposited over a widely extended territory. In this manner the valley was partly filled, and it is the opinion of geologists that the entire western side of the valley is sand and gravel at the bottom. In some places the cover of soil is of such thickness, however, as to make impracticable any idea of developing the gravel deposits commercially.

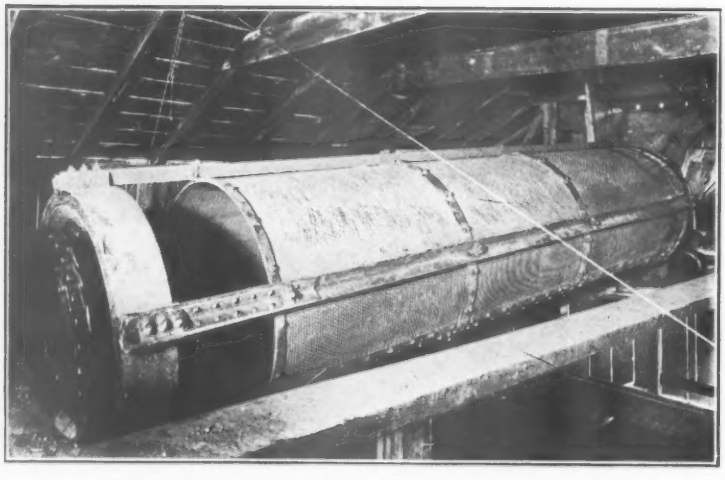
The Mt. Calvary Sand and Gravel Company operates near Columbus, O., a small plant for excavating and preparing sand and gravel for various purposes. Most of the output of the plant is used for surfacing macadam roads in the vicinity of Columbus. A considerable demand for concrete material also is supplied.

When this gravel pit was opened several years ago some 24 to 30 workmen were required to operate it. Within the last year a mechanical installation has been made, which enables nearly 80,000 cu. yd. to be excavated, washed, and delivered to cars or wagons each year, with an average force of only 9 men.

A steam shovel with a ⅝-yd. dipper is used for excavating the material and loading it in 1½-yd. side-dump cars. A portable plank track provided for the steam shovel permits the latter to move about the dippings readily. The shovel handles from 400 to 600 cu. yds. per day, working against a face 15 to 25 ft. in height. One of the accompanying photographs shows car discharging into hopper and also conveyor line.

The cars deliver the material to a receiving hopper placed below the ground surface at a distance of 150 ft. from a screen house. At the bottom of the hopper is a four-way adjustable plate feeder for delivering the mate-

1. PLANT FOR SUPPLYING SAND AND GRAVEL



2. SCREEN IN COLUMBUS SAND AND GRAVEL PLANT.

rials to a belt conveyor. This feeder is operated by a crank and connecting rod driven from the foot-shaft of the conveyor. The crank is fitted with an adjustment, which enables the flow of the materials to be regulated from 200 to 400 cu. yds. per day, according to the desired capacity. The feeder is built with concentrating side plates, which gather the sand and small gravel and deliver them to the center of the trough-shaped belt conveyor. The latter transports the materials up an 18-degree incline on a trestle to the top of the screen house. The conveyor is a 16-in. Jeffrey five-ply rubber belt, having an extra rubber cover, and travels at a rate of 250 ft. per minute.

Approximately 50 per cent. of the deposit in which the pit is located consists of sand. The latter forms a convenient bed for boulders measuring 8 to 12 inches in diameter, so they are carried up on the belt without rolling. The conveyor discharges the material to an inclined Jeffrey revolving screen. An accompanying photograph shows this screen in the upper part of the screen house. The screen separates the sand from the stone, the sand dropping to bins below it, while the tailings are dumped through a chute, set at an angle of 40 degrees, gravitating to a crusher. The latter can be adjusted for reducing the boulders to sizes between ½-in. and 2½-in. cubes, and discharges into a bucket elevator of the continuous Jeffrey type. This elevator has buckets 12 in. long by 8 in. wide and 12 in. deep, mounted on a continuous chain, and delivers the output of the crusher to a second revolving screen. The latter separates the material into four different sizes. The first part of the screen removes the dust; the second portion the pea-gravel; the third part of the screen removes the curbing or concrete gravel; and the tailings, consisting of 2½ to 3-in. pieces are used for heavy concrete and pavement foundation work. A 55-h.p. horizontal steam engine supplies power for operating the conveyor, elevator and screens.

The various sizes of stone are delivered by gravity to bins from which they are discharged through valves into wagons driven directly under the building. The bins also are arranged to discharge into railway cars on a track under the structure.

On account of a large portion of the deposits being sand, a washing system has been installed to insure a clean product. The sand is delivered by water from the bottom of the bin through a flume to two Jeffrey spiral conveyors, each set at an angle of 20 degrees in separate water-tight tanks. One of the spiral conveyors takes the sand from the bottom of the first tank and carries it into the bottom of the second tank. The conveyor in the second tank washes the sand again and discharges it directly to wagons. The water overflowing from both tanks carries away the loam and clay, leaving the clean sand.

EDITORIAL COMMENT

Indebtedness for Public Service Plant May Not Be a Municipal Burden.

Valuations of Public Service Corporations.

INDEBTEDNESS FOR PUBLIC SERVICE PLANT MAY NOT BE A MUNICIPAL BURDEN.

It has long seemed rather incongruous that a municipality which has reached its legal limit of indebtedness should be unable to construct or to purchase a public service industry and make the unpaid portion a lien on the property thus acquired, to be repaid from the net revenues of the plant. A recent decision made by the Supreme Court of Illinois opened a way by which this could be done in a particular case. The statement of the case is as follows:

Clay City in Clay county, Illinois, in 1907 granted to one Theodore Fisher the right to erect an electric light plant with all necessary equipment for the purpose of furnishing light, heat and power to the village for a period of thirty years. The village agreed to pay $70 per annum for each of twenty-three arc lights throughout this thirty-year period. Bonds were issued to the limit allowed by the State law—in this case $4200. These bonds drew 6 per cent interest and the proceeds from their sale were applied on the purchase of the plant, which was to be operated by the city. The balance of the value of the plant ($7296) was secured by a mortgage on the plant equipment and franchise rights, and the mortgage was held by the company which built the plant. In June, 1908, the board of trustees and the president paid $1440.57 interest on the bonds and on the mortgage indebtedness and one of the mortgage bonds. The taxpayers then filed a bill in the circuit court of Clay county, alleging that all indebtedness above the $4200 of bonds was illegal and void and all taxes levied for bonded indebtedness above the amount necessary to meet what was then due on the previous bond issue was illegal.

The bill was answered and an injunction was issued restraining the collection of taxes to pay any part of the mortgage indebtedness. The taxpayers in the bill made no objection to the purchase of the plant nor to the issue of the bonds, but they sought to have the village enjoined from paying any of the purchase price above the $4200, which would result in the loss of the plant and the $4200 paid upon it. From this decree an appeal was made to the Supreme Court.

The Supreme Court held that the only relief that could be had was to enjoin the payment of the mortgage indebtedness out of any other fund than the net income from the electric plant after paying all operating expenses and necessary repairs. It was held that a village or city does not create an indebtedness by obtaining property to be paid for wholly out of the income of the property.

It was further held that the agreement to pay $1610 annually for arc lights during thirty years would constitute an indebtedness for the entire amount and would be illegal. But the purchase of the plant by the village, immediately after its construction, put an end to the agreement and there was no reason for enjoining payment for the lights.

If the plaintiffs had not brought their suit in the form above described, whereby the city would lose its $4200 if the case were decided in the usual way, it is quite probable that the court would not have stepped outside the path which has been more or less clearly laid down in previous decisions. Indeed, the decision quotes approvingly a decision declaring a somewhat similar procedure illegal. But the manifest injustice of a decision which would cause the city to lose a sum which it had every legal right to spend

undoubtedly led to the formulation of a plan whereby the city could complete the program it had laid down.

The net result in this case is a statement that the thirty-year contract for street lighting would be invalid, but the purchase of the plant by the city had put an end to this agreement; a decision that a municipality does not create an indebtedness by obtaining property to be paid for wholly out of the income thereof! and an injunction against the city paying the indebtedness against the property out of any funds except the net revenues of the plant. The decision does not indicate the source of the plant revenues, but, in Illinois, cities are permitted to light their own streets and not to sell light to others, so that the only revenues of the plant would apparently be appropriations made by the city council. It would seem, therefore, that the only thing necessary to carry out the exact program laid out would be to change the form of the ordinance to make a direct appropriation to the electric light plant sufficient to meet all the requirements of the program. Unless, indeed, a municipal plant for street lighting only might be said to have no revenues, in the ordinary sense of that term.

If "a city or village does not create an indebtedness by obtaining property to be paid for wholly out of the income of the property (City of Joliet v. Alexander)," it would seem possible to devise some plan whereby a city could operate a public service plant and pay for it out of the earnings (barring such restrictions as that of electric lighting plants in Illinois referred to above), and make the holders of the evidences of indebtedness secure, within reasonable limits, for the city could increase rates to consumers and payments for service to the city until the excess of receipts over expenditures would, ordinarily, meet the obligations if they matured at a reasonable rate. The Clay City decision really leaves the city's original investment of $4200 somewhat in jeopardy, unless the city has such controls of the income of the plant as are suggested above, so that it can insure the meeting of the obligations as they become due.

If a plant is paid for wholly out of earnings and without municipal obligation other than one secured by the earnings, the usual objection made by the courts, that there is an attempt to secure by indirection an extension of the city's debt limit, does not apply.

If a plant is operated on the plan of the Citizens' Gas Company of Indianapolis, by a private corporation, limited as to profits, and passing to municipal ownership when the capital invested is returned to the investors under the regulations in the franchise, the same result is obtained, but until the ownership passes to the city, the plant is operated by the company and has the limitations regarding change of rates and of contract price for service to the city, to which private corporations generally are subject.

May not the Clay City decision be authority for a variation from former attempts to secure needed public service, which will require from the citizens proposing to supply it only a little more sacrifice, in that the city will not make any preliminary investment, and in that they will be subject to a greater extent to the whims of future city councils in fixing rates and payments for public service, so that the rate at which their investments and the interest thereon will be paid may be subject to considerable variations? If the aforesaid public-spirited citizens are willing to operate the plant until it has paid for itself, then some such plan as that of the Citizens' Gas Company, referred to above, would probably be best, although it might be modified somewhat to make municipal ownership arrive earlier, by giving the city such control over increase of rates as would hasten that time, if desired, and at the same time controlling distribution of profits within set limits so that the increase in revenue would reach the proper channel. However, it is probable that the citizens do not wish to operate the plant, but only desire to establish a plant for the city to operate. In such cases perhaps it will be possible to steer through the

contradictions and fine distinctions in the court decisions on similar projects and bring out something which a court like the Illinois Supreme Court will sustain.

VALUATIONS OF PUBLIC SERVICE CORPORATIONS.

A comparison between the results of the attempts to secure a valuation of the Detroit United Railway in order to secure a basis for a settlement of the present unfortunate conditions existing between the city and the public, with the simple, scientific and successful methods used in securing similar valuations of the property of public service corporations in Wisconsin, for example, demonstrates a number of interesting propositions.

In the first place, the mayor appointed a committee of fifty to investigate the situation and attempt a settlement. Neither this committee nor its sub-committee on appraisal was expert in the technical details, either engineering or financial, and could hardly be expected even to make a thoroughly competent choice of technical experts to guide them in their deliberations. Nevertheless, they made a choice and had an appraisal made. This procedure was so conducted, either by the committee or the sub-committee or the engineer, or through external manipulations, that it failed to reach an understandable conclusion, and the thousands of dollars expended seem thus far to have produced no result, and to have brought the committee back to the point of beginning.

Then the street railway company employed a committee of experts, selected with much better judgment, if measured by results, which is now ready to defend in any required way the details and the totals of its appraisement.

These two appraisements differ by more than the amount of that of the engineer of the committee of fifty, before it was reduced by the committee itself sitting upon the results of the work of its sub-committee.

Neither party has any right to send for persons or papers, neither party has agreed to abide by the results of an arbitration, each party tries to put the other on the defensive, and the consequence is a deadlock on the question of the beginning of an arbitration proceeding. The company is reported to be willing to agree to a board of valuation on which it will be represented, and the city council is considering a new appraisal at the expense of the company.

If Detroit were in Wisconsin, the street railway company could put itself under the State Railroad Commission and receive an indeterminate permit to operate its plant. Any reasonable number of persons considering themselves aggrieved by existing conditions could petition for change of fares, regulations, conditions of operation, etc., and, before the state board would make a decision which would materially affect the financial results of the operation of the company, it would make a thoroughly technical valuation of the company's property and determine the actual results of their operation of the plant. The company's books and records would be open to the commission, its valuation and statements of operation would be received and considered, hearings would be held, and a decision would be reached after thorough consideration of all the facts, with full power to ascertain those facts. This work is done by a commission which is expert because well chosen in the first place and because it is engaged all the time in this kind of investigation, so that it is familiar with all the variations of condition and circumstance. The commission is aided in the technical part of its work by engineers and attorneys, expert and experienced because equally well chosen and constantly employed.

The practical results for both company and city are incomparably better under the Wisconsin system, and the establishment of a Michigan commission or the extension of the powers of its state railroad commission under like statute provisions would be fully justified if it did no more than settle the Detroit difficulty.

THE QUESTION DEPARTMENT

Ordinance Requiring House Connections Before Paving Begins.

Could you give any information referring to a street ordinance requiring all permanent street improvements to be placed under ground before any permanent street pavement is put down, such as gas and water mains, sewers, electric and telephone wires, etc., or could you give me the name of any town where such an ordinance is in effect?

C. M., Galesburg, Ill.

The city of Atlanta, Ga., apparently passes an ordinance on the above subject in connection with the paving of each street. Thus sections 1242 and 1243 of the code of 1899 provide:

All property owners on Peachtree street are hereby notified to make all sewer, gas and water pipe connections from the mains on said Peachtree street within 30 days after the passage of this ordinance, preparatory to paving the same with asphalt. After the pavement is laid on said street it shall be unlawful to in any way cut the asphalt for the term of 5 years.

Section 1247 reads:

The Board of Water Commissioners are hereby required to have all water connections on North avenue between Peachtree and Williams streets made immediately so as not to delay the paving of said avenue. That the Atlanta Gaslight Company are hereby required to bring all gas connections on said avenue to the sidewalk curbing, and place the keyboxes before said North avenue is paved. Property owners are hereby required to make all sewer connections before said avenue is paved. That the said gas company, if they desire to lay a new gas main, shall do so before said avenue is paved; and after said North avenue is paved the said paving shall not be taken up to make any such connections for the term of five years.

There are numerous similar sections applying to other streets.

Camden, N. J., makes provision in Sec. 92 of the 1906 revision of the city ordinances, of which the following is an abstract: Prior to the paving, repaving, grading, macadamizing or other improvement of any street, highway, public place, or alley, or any part thereof, in the city of Camden, it shall be the duty of the Commissioner of Streets to notify all owners of real estate fronting thereon to make connections with culvert, gas and water mains, as approved by the Engineer of Sewers, to and within the curbline. And in case any of them neglect to comply with the said notice for 30 days, it shall be lawful for the Street Commissioner to contract with some person to do the said work, who shall, within 30 days after completion, make out a measurement of the work and account, showing necessary details and the total cost and proportion for each property owner for entry in city books. And the costs and expenses of performing the said work are a lien upon the real estate aforesaid until fully paid. And the contractor shall then proceed to collect the claims and receipt for them upon the books; at the end of six months after the completion of the said work, the City of Camden shall pay the contractor the balance remaining due. The contractor may sue for the amounts due with interest and costs of suit.

The city of Cleveland, O., covers the ground by one brief section, No. 1252, which provides:

Whenever the paving or repaving of any street or public highway shall have been ordered by the council, it shall be the duty of the Board of Public Service to duly serve upon such owners of property abutting on such street or highway, as he may deem necessary, a notice directing such owners to make such sewer and water connections as he may designate within a time therein specified. At the expiration of the time fixed, if such connections are not made as herein provided, the Board of Public Service shall cause the same to be made, and the cost thereof shall be temporarily paid from the general fund of the city. It shall be the duty of the city auditor to prepare and submit to the council, on the first Monday in September of each year, the necessary ordinance for assessing a special tax to reimburse the general fund for all disbursements, including interest on the same therefrom, for said purposes during the preceding year.

Detroit has a similar provision in three sections, 15, 16 and 17 of chapter 31 of its revised ordinances, regarding water, gas and sewer connections.

In Dubuque, Iowa, chapter 33, section 4, provides that the order to pave the street passed by the council is notice to property owners to make "gas, water, sewer, steam heating and all other necessary connections," but there is no penalty for failure other than increase in cost and in difficulty of getting permit for the excavation.

Evansville, Ind., in Ordinance 465, two sections make it the duty of the Board of Public Works to order private connections with sewer, gas and water pipes and to bring them within the curb, and if not obeyed to make the connections, and notify the controller of the actual cost, which he must put on the tax duplicate for collection with other city taxes on the same property.

Hammond, Ind., has a like ordinance, using more words to express the same instructions.

In Harrisburg, Pa., the city engineer must notify property owners on street to be paved, before contract is finally awarded, to make sewer, gas, heating, water or other connections within stated time, not exceeding 60 days, and if they do not obey they are subject to fine not exceeding $100 on conviction before the mayor or any alderman.

In Hartford, Conn., the board of street commissioners may order pipes and conduits in street to be relaid, renewed, repaired or located to prevent future disturbance of the new pavement, and on failure of person or corporation to obey may apply to the Superior Court for a mandamus. Another section requires private gas pipes to be relaid before pavement is laid, and if not done board notifies gas company to cut off the connection. Notice states period, not exceeding 10 years, within which no excavation will be permitted in new pavement. Sec. 113 of the city ordinance provides for notices to gas, telephone, telegraph and electric light companies and water commissioners by publication 6 months before date of beginning paving, all connections to be completed 3 months before such date.

In Kansas City, Mo., the board of public works notifies property owners and corporations interested 60 days before improvement begins, and that no permit for excavation that will disturb the pavement will be issued after the pavement is completed, according to Section 587.

Lafayette, Ind., has quite an elaborate ordinance of eleven sections, providing (1) that no street shall have a permanent pavement until the underground pipes and conduits are laid; (2) for notice to the water works trustees and those having rights to lay pipes and conduits in streets and that in case they do not lay or repair pipes no later excavations will be permitted except on account of accidents; (3) that within 30 days all mains and service pipes between curbs shall be completed and one of each type of service for each lot not built on and for each 66 feet of unplatted ground; (4) for notice to property owners by delivery and publication to make sewer connections, and that if not made within 30 days they will be made by city and assessed on property; (5) providing for letting contract for house sewer connections by the year or otherwise as above provided, for permits for excavations and for marking ends of unused connections; (6) for making water taps by water works trustees and assessing cost on property owner; (7) for city engineer making assessment list for adoption by council to make liens on the property served; (8) that the cost shall be actual cost of contract and advertising, inspector, enrollment and release fees; (9) that city clerk on confirmation of list shall issue to contractor certificate of assessment for each piece of property affected which he can then proceed to collect; (10) for $100 fine for violating ordinance; (11) for enforcement of ordinance on two weeks publication after passage. A supplementary ordinance provides for an inspector of gas, water and sewer trenches, and for permits and licensed contractors, and details of procedure to secure good work.

In Omaha, Neb., the city engineer is required to notify resident property owners, lessees, or agents, water and gas companies by publication or otherwise at least 20 days before contractor begins work, setting time for completion of house connections, from which time until the pavement is completed and formally and finally accepted by the city no permits for house connections will be issued. By another section the water and gas companies are required to make house connections and repairs to point beyond curb so as to supply each lot with gas and water without tearing up or opening the completed pavement.

In Rochester, N. Y., all water and sewer connections are made part of the street paving contract, as well as repairs and cleaning of sewers and water mains.

Saginaw, Mich., has an ordinance with 14 sections providing (1) that the Board of Public Works shall notify property owners to make house connections for sewer, water and gas within 10 days or the Board of Public Works will make sewer and water connections before new pavement is laid and assess the cost against the lots so served; (2) provides method of serving notice by messenger to resident owner or agent of non-resident or by registered mail to last known address or by posting notice in Board's offices, officer to make affidavit of services of notices; (3) provides method of keeping cost and assessing against property if board does the work; (4) provides for hearing appeals from assessments; (5) Council hears appeals; (6) confirmed assessments are collected as are other special assessments; (7) taking up new pavement without permission of Board is forbidden; (8) provides methods and circumstances under which permits for cutting into pavements may be granted; (9) provides that applicant shall pay $1 per lineal foot of excavation and the expense of taking up and relaying pavement as well as excavation and puts the money so collected in highway fund of district; (10) superintendent of public work is directed to take up and replace pavement; (11) precautions against accident and for prompt work by property owner's agent; (12) ordinance does not interfere with work in progress at time of its passage; (13) fine for violations of ordinance up to $100 or on default up to 90 days in jail; (14) repeals former ordinance.

Trenton, N. J., provides that no pavement shall be laid until the sewer connec-

tion with each lot on the proposed improvement has been laid to the curb line; also that notice shall be given property owners to make water and gas connections within 20 days on penalty that no further permits for such connections will be granted for 5 years.

The charter of the city of Troy, N. Y., provides that no street shall be paved until sewer and water mains are laid to serve the property, and also provides that the house connections must be put in and assessed as part of the cost of sewer and water main construction. It also provides for notice by the city council to property owners on streets to be repaved to make such connections and to assess fines if they do not comply with the notices.

These examples cover most of the plans for such ordinances. The details differ according to the laws of the States, particularly the assessment laws, the forms of city government, the contracts or franchises of public service corporations, etc. For any particular State and city the ordinance should be prepared by the city attorney or some one else familiar with the laws and customs of that State and city.

Charges for Engineering Services.

As one of the elements of professional ethics should be the charging of a just amount for professional services, I should like to ask some information as to proper charges for engineering work in Indiana, say. Is it generally figured as a percentage of the cost of construction. For instance, what would be a reasonable charge for the work on the construction of a dam and reservoir, including preliminary levels and measurements, levels for clearing and stripping reservoir site, designing dam and spillway (the latter of concrete with a concrete bridge spanning the opening, costing $5,000; the remainder of the dam being of earth, and making a total cost of $8,000), staking out and having general oversight during construction. It is not desired to make the charge on a basis of "get all you can," or "what the traffic will bear," but only a fair, honest, reasonable amount, considering the nature and amount of the work.

F., ———, Ind.

There is no custom regarding charges for engineering services. In Indiana the estimation of the value of engineers' services is ordinarily very low, due, probably, to the impossibility under the constitution of fixing the qualifications of the only official engineer with which the general public comes in contact, the county surveyor, and the low standard of qualifications ordinarily required of city do county work independently of the engineers and of engineers employed to county surveyor. It has been difficult in the past for the engineer to secure a per diem for work done of more than $5 and almost impossible to reach beyond $10. Gradually the standard is being elevated and the compensation is increasing at the same time, but reasonable figures have not yet been reached except at rather infrequent intervals.

A rather common method of securing better compensation, sometimes at the expense of the quality of the work, is to offer to complete the engineering work or some definite portion of it for a fixed sum. If the engineer does not make a safe estimate, he may be in worse condition than if he were on a per diem basis, unless he succumbs to the temptation to make himself whole by slighting his work somewhere. There are existing examples of each occurrence. Very few contracts for engineering work have been taken in Indiana on a percentage basis and notwithstanding the fact that this is the fairest to both parties and is the method commonly followed by architects, some mechanical and electrical engineers, and others, it is not popular among employers, and probably will not be until engineers show more interest in the financial condition of the profession at large than they have heretofore. The engineers of the State should adopt a standard schedule of charges as a means of educating the public to the value of really good service even if they are sure that few, if any, of the engineers of the State will follow it exactly. In fact, conditions will very often require more or less modification of any form of schedule that is likely to be adopted. But the existence of such a schedule and the earnest efforts of engineers to get as near to it as possible will bring vastly better results than the present lack of any scale of prices whatever.

Pending the adoption of such a schedule, MUNICIPAL ENGINEERING has answered such inquiries as the above by quoting the schedule printed in vol. xiii, p. 197. This schedule applied to the present case would authorize the following charges: Preliminaries, 1 per cent; plans and specifications, 2 per cent; details, 1 per cent; supervision, 1.5 per cent; engineering superintendence, 3 per cent; alterations, 5 per cent of value of work involved in the alterations. Apparently the case in hand would include the first four items, at least, or, in all, 5.5 per cent, or possibly the first three and the fifth, or, in all, 7 per cent, according to the responsibility of the engineer and the consequent necessity for close superintendence of the work. The former would make the total engineering charge, including all services of assistants, $440; and the latter, including all inspectors, $560.

Some consideration is given the subject in the July number, vol. xxxix, pp. 36 and 37, and in vol. xxxviii, p. 346, the latter giving a list of previous articles on the same subject.

Will our readers join in this discussion and give some idea of their own experience not alone in Indiana but throughout the country?

Dumping Catch Basin Refuse in Sewer.

On page 564, vol. 41, of 1900 *Engineering and Building Record*, I learn that one large city in your State is dumping catch basin material into the sewer. If you can learn the name of the city, what affect, if any, has it on the sewer? We are figuring on adopting this in Chicago, hence I am anxious. L. M., Chicago, Ill.

Probably the city of Indianapolis is referred to. The practice in that city is to wash at least a part of the catch basin refuse into the sewer, by means of a hose, which introduces water under rather low pressure into the basin.

The theory upon which catch basins are designed, is to keep street refuse from entering the sewers, and in cities upon as level ground as Indianapolis and Chicago they are fully justified by the relief they give to the sewer cleaning gang, and the prevention of stoppages of sewers at times of heavy rains. If the sewage must be pumped, as is now required for some Chicago sewers and will be for others, and as will be required in Indianapolis when sewage purification begins, the value of the catch basins is again demonstrated, both in the pump well and in the sewage disposal plant.

Catch basins must be kept clean if they are to fulfill their office, and cleaning catchbasins is expensive, especially if the dirt in them must be lifted out and carted away. The temptation is great to dump this dirt into the nearest sewer, either through a manhole or by washing it out of the basins directly into the sewer. If the sewage is to be pumped or purified, this should not be permitted; if not, the question is one of relative expense of removal. The Indianapolis plan, when the basins discharge into large sewers with deep, constantly flowing current, seems to work well. If the sewers are small and the flow of sewage at maximum rate is very intermittent, the catch basin refuse will sooner or later cause stoppages of the sewers, or, if the sewers are cleaned at frequent intervals, will require more labor to keep them clean. It is difficult to say how much cost of sewer cleaning should be charged to the Indianapolis method of disposing of much of its catch basin refuse, so that no really successful defense of or attack upon the method can be made. In Chicago the river must be dredged to remove the accumulations of street dirt and the cost of this operation would be increased by adding the catch basin refuse. It is quite possible that this method of removal is less expensive than that of lifting the dirt from the basins and hauling it long distances in wagons.

For free flow of sewage into a free outlet, the control of storm debris by the catch basins and the subsequent discharge of this debris, with sufficient addition of water, into sewers with large flow of sewage may readily be justified. Like discharge of the debris into smaller sewers or in large quantities at one time or place should be discouraged as likely to cost more for sewer cleaning than is saved in catch-basin cleaning. And when the sewage must be pumped or purified this method of disposing of catch-basin refuse should be prohibited.

The article referred to in the inquiry gives the following figures concerning cost of cleaning catch-basins:

COST OF CATCH BASIN CLEANING IN AMERICA

Frequency of Cleaning.....	Cost Per Year			Cost Per Cleaning			Cost Per Cu. Yd.			No. of Cities Rep'g
	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean	
When full, necessary or offensive	$10.00	$3.00	$5.00	$4.00	$0.26	$1.74	$1.60	$1.08	$1.34	21
After a heavy rain	.....	....	....	....	....	....	....	....	....	7
1 to 3 times per year	3.36	1.50	2.15	1.21	0.30	0.69	....	....	1.15	14
4 to 6 times per year	4.50	3.36	4.03	....	....	0.40	....	....	1.15	8
7 to 9 times per year	.....	....	1.34	....	....	....	....	....	....	4
10 to 12 times per year.....	.....	....	....	....	....	....	....	....	....	5
More than 12 times per yr..	13.90	3.00	8.15	....	....	....	....	....	....	7
Total cities reporting.....										66

Ninety-two per cent of catch-basins are cleaned by the city.

Four hundred yards per year is the average amount removed from catch-basins.

Twenty-eight cities use the old bucket method.

Wilmington, Del., has a removable bucket placed in the bottom of the catch-basin.

Boston has tried the vacuum method.

Books on Cemetery Designs.

I would consider it a great favor if you could and would give me some information on the platting or laying out of cemeteries and where I could purchase books on this kind of work.
I. R. B., Port Allegany, Pa.

The books listed in MUNICIPAL ENGINEERING, vol. xxxviii, p. 113, on landscape gardening will aid in such work.

Parsons's "Landscape Gardening" ($3.50) gives some direct consideration to the laying out of cemeteries. Mr. Waugh has in preparation an American edition of Kemp's "Landscape Gardening" which should be of value also. *Park and Cemetery,* is a periodical published in Chicago ($1 a year) which is devoted to the details of such work.

Plans for City Halls.

We are anxious to get some prints, some that would be of service to us in way of suggestions for modern city halls; perspectives, elevations and floor plans of buildings ranging from 30 to 50 thousand dollars. W., Salina, Kan.

Bicknell's "Public Buildings" ($2.50) and Palliser's "Court Houses, Village, Town and City Halls, etc.," ($2) give some suggestions that may be of value.

The *Brickbuilder and Architectural Monthly* ($5 a year), 85 Water street, Boston, Mass., has published some such plans.

Can our readers refer to other sources of such information?

Fire Underwriters' Electrical Code.

Can you advise me as to where I can secure a copy of the National Electrical Code of the National Board of Fire Underwriters and copy of the List of Electrical Fittings by the same board? An ordinance has been passed here requiring all electric wiring to be according to the specifications of the National Fire Underwriters, and I have been appointed inspector.

N. W. GREEN, City Engineer,
Helena. Ark.

Copies of the code should be obtainable from the local representatives of companies under the National Board of Fire Underwriters, or the agent having supervision over inspections in the State. The "National Electrical Code" and the latest semi-annual issue of the "List of Electrical Fittings" can doubtless be obtained also of the "Electrical Bureau of the National Board of Fire Underwriters" either at 135 William street, New York City, or at 382 Ohio street, Chicago, Ill.

Lining For Reservoir.

There has been some talk of putting in an emergency reservoir to hold about 200,000 gallons. It is on a side hill where the ground would be solid but would doubtless have to be puddled. How thick would the clay puddling have to be? The water would be perhaps 10 or 12 feet deep.

I have some willows growing on the edge of the reservoir. Is there any way of killing them without pulling them out by the roots, which in this instance would be quite difficult?

O. O. L., ——, N. Y.

The subject of linings for reservoirs is well discussed in such books as Turneaure and Russell's "Public Water Supplies," ($5), Folwell's "Water Supply Engineering" ($4) and Goodell's "Water Works for Small Cities and Towns" ($3). The three agree very nearly upon 18 to 24 inches as the thickness of such a lining; that the slope of the reservoir sides should be from 1½ to 2 horizontal for 1 vertical; that ordinarily the clay must be protected from the direct contact of the water by stone, brick or concrete lining from 4 to 8 inches thick, but that under favorable circumstances a gravel layer may be sufficient. Pure clay is not recommended, but various mixtures with gravel or with sand and gravel are quoted. Some failures under peculiar circumstances have occured under the most approved methods of construction.

Will any of our readers answer the latter question?

Makers of Drinking Fountains.

Can you give me the address of the manufacturers who make or can furnish the sanitary drinking fountains such as are now being used in the parks of the principal cities? We want to install them in our village park. Also names of manufacturers of ornamental fountains.

A. B., ——, New York.

There are numerous makers of sanitary drinking fountains. Among those nearest our correspondent are Aird-Don Co., Troy, N. Y., Day-Ward Co., Warren, O., F. N. DuBois & Co., 243 Ninth Ave., Meyer-Sniffen Co., 11 W. 36th St., J. L. Mott Iron Works, 118 5th Ave., New York City, Standard Sanitary Mfg. Co., Pittsburg, Pa. Several of the same manufacturers make ornamental fountains also.

Water Supplies by Compressed Air.

I write you to know if you can give me any information or refer me to any articles on the compressed air system of water works for small towns of 1,000 to 2,000 population. And can you give me the names of towns having this system in use, and also the names of companies who install the system?

C. M. T., ——, Mont.

If the air lift method is referred to, articles on the subject will be found in MUNICIPAL ENGINEERING, vol. xv, p. 240, vol. xxvi, p. 345, vol. xxxi, p. 297, which discuss the principles of the subject; vol. xxix, p. 17, which gives a list of makers of apparatus; and vol. xxii, p. 89, and vol. xxxii, p. 169, which give references to books and articles on the subject. Goodell's "Water Works for Small Cities and Towns" ($2) devotes the most space to the subject of any text book.

If the method of pumping into a tank and depending upon the pressure of the air compressed in the tank to deliver water, thus taking the place of a stand-pipe, the writer knows of no wholly successful plant for a city of the population named. The method is used for small private installations mainly. Such manufacturers as the American Well Works, Aurora, Ill., can give information on this subject. Can our readers report any experience with such plants?

Electrolysis of Underground Structures in American Cities.

We shall be obliged if you will tell us, or advise us where we may learn, what regulations have been adopted in various cities of this country with regard to the electrolysis of gas and water pipes.

STONE & WEBSTER, Boston, Mass.

But little has been done in the way of regulation of electrolysis in this country. A few cities have ordinances and a few have contract provisions and others are operating under agreements resulting from settlements of suits for damages. The following details are at hand:

The city of Mobile, Ala., has an ordinance providing that all electrical companies shall furnish adequate ground return systems in order to prevent electrolysis. A penalty of $50 per day is provided for violation.

Cincinnati has provisions in contracts or franchise ordinances requiring the double trolley system.

Houston, Texas, has a cooperative contract with the traction company, providing for an investigation, and the elimination of all electrolytic troubles.

Cleveland, Ohio, holds the traction company strictly to account on all trouble from electrolysis and enforces a good system of rail bonding and return feeders.

In 1905, Altoona, Pa., sued the traction company for $45,000 for bamages to the water service.

In 1901, the city of St. Paul brought suit against the traction company for damages to water pipes due to defective return circuits. The suit was compromised in 1903 by the traction company agreeing to pay for all pipe damaged in the past and future; and by the further agreement that a more adequate return feeder system would be installed. Tests are made periodically by the city to determine if any electrolytic action is going on.

The regulations in force in England will be found on another page of this number of MUNICIPAL ENGINEERING.

In the following table is given information about the conditions regarding electrolysis in many cities in the United States and the treatment of the matter by the municipal authorities and the various public service corporations interested.

City.	Tests Made.	Rail Bonding.	Return Circuit.	Electrolysis.	Remarks.
Birmingham, Ala.	Irreg.	Good	Fair	Slight	6-in. pipe destroyed in '07.
Mobile	None	Good	Good	None	Ordinance protects city.
Montgomery	None	Good	.....	Slight	
Los Angeles, Cal.	None	.....	.....	Much	Cement pipe joints for insulation.
San Diego	None	Good	Good	None	
San Francisco	None	Good	Good	Slight	
Denver, Col.	*	‡	Good	None	
Bridgeport, Conn.	None	Good	.....	None	Tests in 1906.
Hartford	None	Good	§	Much	Buried return circuit bad.
New Haven	Reg.	Good	Good	Slight	
Wilmington, Del.	.....	Good	‡	None	
Jacksonville, Fla.	.....	.....	.....	None	Dry salt soil.
Key West	.....	.....	.....	None	Dry salt soil.
St. Augustine	.....	.....	.....	None	Dry salt soil.
Tampa	.....	.....	.....	None	Dry salt soil.
Atlanta, Ga.	**	‡	.....	None	
Brunswick	None	.....	.....	None	
Columbus	None	.....	.....	None	
Macon	None	.....	.....	None	
Rome	None	Good	.....	None	
Chicago, Ill.	**	‡‡	Good	None	
Freeport	None	Poor	.....	Much	
Peoria	.....	‡‡‡	None	Much	
Quincy	None	.....	.....	None	
Rockford	None	Good	Good	None	
Springfield	None	Good	Good	None	
Evansville, Ind.	None	.....	.....	Slight	
Indianapolis	None	Good	Good	None	
Richmond	None	Poor	.....	Much	
Davenport, Ia.	None	Good	Good	Slight	
Des Moines	Irreg.	.....	.....	Slight	
Dubuque	None	Good	Good	None	
Kansas City, Kan.	None	Good	.....	Slight	
Louisville, Ky.	***	Good	Good	None	
New Orleans, La.	None	Good	Poor	Much	
Augusta, Me.	None	.....	.....	None	
Portland	None	.....	.....	None	Tests in 1905.
Boston, Mass.	****	Good	Fair	Much	Main under Charles River in particular.
Brockton	None	.....	.....	Slight	
Cambridge	Irreg.	Good	Fair	Slight	
Chelsea	**	.....	.....	Slight	
Everett	None	.....	.....	Much	
Fall River	**	Good	Good	Slight	
Fitchburg	None	.....	.....	None	
Gloucester	None	Good	Good	None	

City.	Tests Made.	Rail Bonding.	Return Circuit.	Electrolysis.	Remarks.
Haverhill	None	Good	Good	None	
Lynn	None	Good	Good	None	
Marblehead	None	Good	Good	None	
New Bedford	Reg.	.....	.....	Slight	
Salem	None	Good	Good	None	Tests in 1905.
Somerville	None	Good	Good	None	Mains plugged and bonded to rails.
Taunton	**	Fair	.....	Slight	
Duluth, Minn.	Freq.	Good	Good	None	
Minneapolis	Irreg.	Good	Poor	Slight	
St. Paul	Reg.	Good	Good	Slight	City gets damages for all pipe injured.
Grand Rapids, Mich.	None	.....	.....	Much	
Kansas City, Mo.	None	Good	Good	None	
St. Joseph	None	Good	.....	None	
Lincoln, Neb.	None	.....	.....	None	
Omaha	Irreg.	.....	.....	Slight	
Berlin, N. H.	None	.....	.....	None	Tests in 1906.
Manchester	Reg.	Good	Good	None	
Camden, N. J.	Reg.	Good	Good	None	
Elizabeth	***	Good	Good	None	
Binghamton, N. Y.	Irreg.	.....	.....	None	
Buffalo	None	.....	.....	Slight	
New York, B. R. T.	Reg.	Good	Good	None	
New York, N. Y. & Q.	Reg.	Poor	Poor	Much	
Schenectady	None	Good	Good	Slight	
Utica	***	Poor	.....	Much	
Charlotte, N. C.	None	.....	.....	None	
Wilmington	None	.....	.....	None	
Cincinnati, O.	None	.....	§§	None	
Cleveland	**	‡‡‡	.....	None	
Dayton	None	Good	Good	None	
Toledo	**	Good	Good	None	
Altoona, Pa.	None	.....	.....	Slight	City sued Ry. Co. for $45,000 in 1905.
Erie	None	Poor	Poor	Much	Pumping machinery damaged.
Harrisburg	None	Good	Good	None	
Lancaster	None	Good	Good	None	
Philadelphia	**	Good	Good	None	
Pittsburg	**	Good	Good	Slight	
Reading	None	Good	Good	None	
Scranton	None	Good	.....	None	
Wilkes-Barre	None	Good	Good	None	
York	Irreg.	.....	.....	Slight	
Newport, R. I.	None	.....	.....	Slight	
Pawtucket	None	Good	Fair	Slight	Tests in 1906.
Columbia, S. C.	None	.....	.....	Much	
Chattanooga, Tenn.	None	.....	.....	Slight	
Memphis	None	Good	Good	None	
Nashville	None	.....	.....	Much	Gas company has sued for damages.
Austin, Tex.	Tel. Co.	Good	Good	Slight	
Beaumont	Irreg.	Fair	Fair	Slight	
Dallas	**	Good	Good	Slight	
El Paso	***	‡	Fair	Slight	
Fort Worth	None	.....	.....	Slight	
Galveston	None	None	None	Slight	Salt soil makes good return.
Houston	***	Good	.....	None	
San Antonio	None	Good	Good	None	Tests in 1906.
Waco	***	Good	.....	None	
Ogden, Utah	None	Good	.....	None	Tests in 1905.
Burlington, Vt.	None	.....	.....	None	
Lynchburg, Va.	**	Good	None	None	
Norfolk	Reg.	Good	.....	None	
Petersburg	None	Good	Good	None	
Roanoke	None	Good	Good	Slight	
Seattle, Wash.	Irreg.	Poor	None	Much	
Tacoma	None	.....	.....	Much	
Wheeling, W. Va.	None	.....	.....	Much	One 20-in. main replaced.
Madison, Wis.	None	‡‡‡‡	None	Slight	Slight trouble '05 caused bond'g.
Milwaukee	None	Good	Good	Slight	Tests in 1903.
Superior	None	‡	None	Slight	

*By water and street railway companies.
**By electrical department.
***By street railway company regularly.
****By city and Water and Sewerage Board.
‡Bonding across and to water mains.
‡‡Rails cast welded and copper bonded.
‡‡‡Double brazed.
‡‡‡‡Electrically welded.
‡‡‡‡‡Near power house.
§Uninsulated ground.
§§Double trolley.

Meter Rates for Water by Gravity System.

Our town is having a struggle over meter rates and we would like to obtain meter rates of places of similar size and location. We have a population of 5,000, and our system is a gravity system, furnished from springs. Could you furnish any statistics or inform us of towns where we could write? I have written to the meter companies, but seem to get very little information from them.

STEIN BANGS, City Engineer,
Rapid City, S. Dak.

It is quite common to base water rates in one municipality upon those in others, but the principle is wrong, for there are always differences in conditions which make such a procedure incorrect and the results inequitable. The only safe way is to determine the actual cost of supplying water, including operation and depreciation, with a liberal allowance for contingencies. Then the quantity of water used should be determined as nearly as possible. If meters are to be introduced into a system already established, a large allowance must be made for reduction in comsumption when meters have been installed. With the total cost and this corrected estimate of consumption the average rate to be charged for water can be computed. Then the distribution of charges to consumer can be made. There is a definite cost of book-keeping, supplying and maintaining meters and reading them which is practically a constant expense, no matter what the amount of water used may be. This is taken care of by making a minimum charge per year or month. Thus in Madison, Wis., (MUNICIPAL ENGINEERING, vol. xxxix, p. 6) the charge is $4 a year for any amount of water used up to 3000 cubic feet. Other considerations cause variations in charges with amount used. Thus, Madison charges 13 cents per 100 cu. ft. for the next 5000 cu. ft. of consumption above the first 3000; 10 cents for the next 15000 cu. ft., and 5 cents for all above 23000 cubic feet used in a year. This method of charging has the authority of successful use. Theoretically the equitable charge is one which includes first the constant minimum charge for each meter in use, and second a constant charge per 100 cu. ft. or per 1000 gal. for all the water used. Practically, questions of business expediency, such as the development of manufacturing industries and other large users of water for the benefit of the city at large or furnishing water for such consumers as cheaply as they can supply their needs by private plants, lead cities to adopt sliding scales, reducing the unit charges as the rate of consumption increases. No water plant can afford on the one hand to ignore the constant minimum cost per tap, and those which have made their charges strictly proportional to water measured are sooner or later obliged to fix a minimum charge. On the other hand no plant can afford to reduce the charge for water for large consumers below the cost of supplying the water. If it is necessary to do this in order to attract an establishment to the town, the special reduction below cost of delivery should be charged to the general revenues of the city and not to the revenues of the water plant. This subject is discussed in several numbers of MUNICIPAL ENGINEERING, for example, in vol. xxxix, p. 18; vol. xxxvii, p. 25. Some further discussion with references to a number of earlier articles will be found in vol. xxxvii, p. 183.

In vol. xxxv, p. 12 is a table showing the averages of rates for water in 375 cities. The average maximum meter rate is given as 26.2 cents per 1000 gallons and the average minimum rate as 9.2 cents per 1000 gallons. The table is from a paper by Dow R. Gwin before the American Water Works Association.

Following are the schedule meter rates in cities supplied by gravity systems, which are listed in Mr. Gwin's tables. A few of those given below also have supplementary pumping plants to use in case of emergency, or for high service districts or fire pressure, etc. The maximum rates, given first, are for the use of small quantities of water and the minimum rates are for the largest quantities named in the respective schedules. All are per 1000 gallons.

Plants under private ownership: Bridgeport, Conn., 20 and 4; Bristol, Conn., (6500 population) 30 and 5; Butte, Mont., 50 and 20; Connellsville, Pa.,(7500 population) 27 and 4; Greenville, S. C., 40 and 10; Greenwich, Conn., 29.3 and 16.1; Hagerstown, Md., 30 and 5; Helena, Mont., 40 and 20; Johnstown, Pa., 40 and 5; Little Falls, N. J., (population 4000) 40 and 5; Monessen, Pa., 30 and 8; Morgantown, W. Va., 30 and 10; Norwich, N. Y., (6000 population) 15 and 10; Oakland, Cal., 39.6 and 31.2; Ogden, Utah, 20 and 6; Oneonta, N. Y., (7500 population) 50 and 20; Portland, Me., 26.6 and 9.3; San Francisco, Cal., 33 and 16; Santa Fe, N. M., (6000 population) 30 and 10; Scranton, Pa., 20 and 6; Southbridge, Mass., 30 and 15; Williamsport, Pa., 10 and 5; York, Pa., 2 and 5.8. The average highest rate is 30.7 and the average lowest rate is 11.8, both near 20 per cent greater than the average of all the plants in the tables, given above. The average rates of the smaller cities, whose populations are given above, are 32 and 13.2, still higher.

Plants under municipal ownership: Altoona, Pa., 33 and 4; Amsterdam, N. Y., 21.4 and 4.2; Arlington, Mass., (9000 population) 20 and 13.3; Asheville, N. C., 25 and 8; Athol, Mass., (7500 population) 25 and 5; Baltimore, Md., 20 and 6; Bayonne, N. J., 26.6 and 13.3; Brockton, Mass., 26.6 and 13.3; Clinton, Mass., 33.3 and 8.6; Concord, Mass., (5000 population) 26.6 and 10; Corning, N. Y., 36 and 9; Fitchburg, Mass., 24 and 5.3; Geneva, N. Y., 20 and 6; Hartford, Conn., 16 and 8; Holyoke, Mass., 5.1 and 5.1; Hornell, N.

Y., 24 and 6; Ithaca, N. Y., 31 and 8; Jersey City, N. J., 20 and 10; Kingston, N. Y., 22 and 6.6; Leominster, Mass., 26.6 and 2; Los Angeles, Cal., 9.3 and 9.3; Malden, Mass., 25.3 and 8; Newark, N. J., 15 and 9; New Britain, Conn., 10 and 4; Newburgh, N. Y., 10 and 3; New London, Conn., 16 and 6; New York, N. Y., 13.3 and 13.3; Norwich, Conn., 40 and 5.3; Reading, Pa., 30 and 2.2; Rochester, N. Y., 14 and 14; South Norwalk, Conn., (7000 population) 5 and 5; Springfield, Mass., 29.3 and 6.6; Syracuse, N. Y., 16.6 and 4.6; Waterbury, Conn., 30 and 5; Worcester, Mass., 25 and 10; Washington, D. C., 4 and 4. The average maximum rate is 21.6 and the average minimum rate is 7.2 cents per 1000 gallons, both near 20 per cent less than the average of all the plants in the table, given above. The average rates for the smaller cities whose populations are given above are 19.2 and 8.3.

The average maximum meter rate in the 58 gravity plants named above, without reference to ownership, is 25.2 and the average minimum is 9 cents per 1000 gallons, which are very slightly less than the averages for all the plants in the tables referred to above, without reference to method of supplying water. The average rates for all the smaller cities whose populations are given above are 26.9 and 11.2. The indications are of a tendency to higher rates in the smaller cities.

Information About Water Rates.

If you know where I can procure a directory or other publication giving the rates charged for water in the respective cities and towns of the United States, I shall be obliged if you will kindly give me the title of the publication.

CHARLES MCLEAN, Dubuque, Iowa.

Meter rates for gravity supplies in small cities are given in the answer to another question in this number of MUNICIPAL ENGINEERING. Rates in Connecticut cities are given in the August number, vol. xxxix, p. 121. The latest considerable collection of water rates is in a paper by Dow R. Gwin of Terre Haute, Ind., before the American Water Works Association, which he may be able to furnish. The largest collection of water rates is in the "Manual of American Water Works" ($5), the latest edition of which was issued in 1897.

Charge for Water for Laying Macadam.

We would like to have you give us an estimate as to the cost of water per square foot, for road construction for macadam roads in our city. Our rates for water are 25 cents for a thousand gallons. We should like to arrive at some just basis to be used by contractors doing public work.

LAKE FOREST WATER COMPANY,
Lake Forest, Ill.

Professor Baker in his book on "Roads and Pavements" ($5) estimates the cost of supplying water by hand pumping on highway construction at 2 cents per cubic yard of broken stone placed. If the macadam is laid 6 inches deep, this would make the cost per square foot of macadam surface 0.037 cent. This is apparently equivalent to a rate of about 21 cents per 1000 gallons of water used, so that for a rate of 25 cents the rate per square foot would be nearly 0.044 cent. Depending on the ideas of the engineer regarding the use of water, and the character of the sub-grade, the amount of water may vary from one-third the above amount to four-thirds. Heavy soils, like clay, require the use of the least amount of water possible, while porous sandy or gravelly soils may use the largest amount named. If the thickness of macadam is more than 6 inches the price per square foot should be increased proportionally.

Municipal Light and Water Plants in Illinois and Indiana.

I am an alderman of this city and as some of us favor the establishing of a municipal electric lighting plant in conjunction with our water plant, owned and operated by the city, you would greatly oblige me if you Illinois and Indiana who own their electric light plants, as I would like to investigate the question from a practical and tried standpoint. A. G., ———, Ill.

A list of cities owning both water and electric light plants is given in MUNICIPAL ENGINEERING, vol. xxxvii, p. 257. Aurora and Springfield, Ill., are included in this list. Another list is in preparation and will add Batavia, Bloomington, Downers Grove, Galva, Geneva, Grayville, Louisville, Naperville, Paris, Rantoul, Sandwich, Sullivan, Waterloo, and Western Springs, Ill., and Albion, Attica, Auburn, Butler, Columbia City, Edinburg, Frankton, Garrett, Gas City, Knightstown, Mishawaka, Nappanee, New Castle, North Vernon, Oxford, Rensselaer, Rushville, Summitville, Tell City, Veedersburg, Vevay, Warren, Williamsport, and Winamac, Ind. There are still others in both States which own their electric light plants but not their water plants.

Cost of Laying Water Mains.

Could you let me know where I can find information regarding the cost of laying water mains in small towns of 2,000 inhabitants or less? If you have information directly at hand you might give me cost of laying 6-inch main 5 feet underground, macadam road, clay soil.

G. H. H., Monsey, N. Y.

Data on this subject will be found in many back numbers of MUNICIPAL ENGINEERING. In vol. xxxv, p. 254, is given the cost of laying each size of pipe in Providence, R. I. That for 6-inch pipe is 81.5 cents per foot, counting iron pipe at $36 a ton and not including hydrants.

Books treating the subject more or less fully are Folwell's "Water Supply Engineering" ($3), and Russell's" Public Water Supplies" ($5).

The most accurate method is to compute the cost of trenching and back filling for depth required; pipe laying; and cost of pipe at local prices delivered and thus determine the total cost for the particular conditions. The books referred to give such figures as the following for 6-inch pipe:

Cost of pipe at $30 a ton	$0.68
Cost of excavating and back filling	0.065
Cost of laying including materials.	0.064
Total cost, say	$0.81

Actual cost in Plainfield, N. J., is given as 63.3 cents a foot, and about the same at Alliance, O. This figure does not include replacing pavement, which would add materially to the cost. Probably the latter figure will prove to be the more nearly correct for our correspondent's case.

Cement Manufacture in Mexico.

Are there any cement factories in Mexico other than the three mentioned in the latest edition of the "Directory of American Cement Industries?"

S., New York City.

There are no other factories in operation than the puzzolan factory at Monterrey, Nuevo Leon and the Portland cement factories at Hidalgo, N. L., and Dublan, Hid. There have been reports of a plant operated near Mexico City by Arenzana & Cia, but mail addressed to them is returned undelivered.

Several new plants are in contemplation. The Cementos Hidalgo S. A., operating the plant at Hidalgo, proposes to increase its output. The Compania Bancaria de Obras y Bienes Raices, S. A., which owns the plant at Dublan, is increasing its capacity and proposes to build other plants at various places. Mexico City, Aguas Calientes, Puebla, Durango, Torreon and Morelia being mentioned as possible locations.

There is apparently an independent movement, headed by Cristobal Martinez, to build a plant at Torreon, but this is no further than the "projected" stage.

F. A. Losh, of Santa Clara, Cal., is reported to be considering the construction of a plant near Mexico City. Perhaps this is the same project which has developed to the organization stage as the Toltec Portland Cement Co., an Arizona corporation with an authorized capitalization of $1,000,000, which proposes to build a plant at Tula on the main line of the Mexican railroad, 48 miles from Mexico. The directors are from Kansas, and Louisville, Ky., and F. L. Larabee, Stafford, Kan., is president. The general manager and engineer in charge is reported to be W. E. Burke, Sanza Hotel, Mexico City. Electricity will be the motive power supplied from a hydro-electric power station nearby and oil will be the fuel for burning the cement. The contract for the equipment is said to have been awarded. The capacity of the plant when fully completed is expected to be 1,500 barrels a day, and the machinery proposed includes a crusher, 2 ball mills and 6 tube mills for raw material, 2 kilns and 6 tube mills for the finishing mill.

The International Portland Cement Co. is an Arizona corporation with an authorized capitalization of $2,500,000, which proposes to build a 2,000-barrel plant on its 2,800 acres of property west of Juarez, Mex., opposite El Paso, Tex. The Freeborn Engineering and Construction Co., Kansas City, Mo., is said to have the contract for construction. The offices of the company are stated to be at 1327 Commerce building, Kansas City, Mo. The project seems to be in the "organization" stage.

Kansas City's New Bond Issue.

The bond issue election held in Kansas City resulted in a victory for all the questions under consideration except the Armory, $250,000; the Art Museum, $200,000; the Chase school, $25,000; and the park improvement, $650,000. The items that were voted on favorably were as follows:

For the completion of the market house on the North Side, which will furnish stalls for the gardeners, who daily market their product in Kansas City, and bring about more sanitary conditions and increase the revenue of the city $50,000.

For giving fire protection to ten thousand citizens of the city within the new city limits, who are at present without it, $100,000.

For increasing the capacity and efficiency of the water works in accordance with the plans of George H. Benzenberg, the Milwaukee engineer, who made a careful study of the needs of the system, $1,000,000.

For levees and other improvements for the Missouri river front to get it ready for navigation, $75,000.

For the erection of a house of correction on the city farm at Leeds, $50,000.

For the installation of a city paving plant to enable the immediate repair of holes in the streets and at actual cost, $50,000.

For the establishment of an incinerating plant, $100,000.

For the erection of a tuberculosis hospital, $50,000.

For extending the sewer system of the city, $300,000.

For the Twelfth street traffic way, properly to unite the east and west sides of the city with a traffic way at a grade low enough for heavy traffic, $475,000.

For the building of modern bridges to take the place of old wooden structures that the Board of Public Works cannot condemn now because of the needs of traffic across the Blue river and Brush creek, $200,000.

For the erection of a city hospital for persons afflicted with contagious diseases, $75,000.

FROM WORKERS IN THE FIELD

Practical Points from Practical People.

Contributions to this Department are invited. Give from your experience for the benefit of others. No matter about the style of the composition, the fact is what is wanted. Use the Question Department for what you want to know; use this Department for what you can tell others.

A Serviceable Electric Hoist.

Mr. Nimrod Johnson, superintendent of the municipal lighting plant, of Richmond, Indiana, has an electric hoist that he believes in harnessing to almost any kind of work. At present he has the hoist at work down by the river, about a hundred yards from the power plant. The work consists of dredging the gravel out from around the intake of the plant's pumping engines. About 500 yards of gravel were removed in two days and it was sold for building purposes. The river will in a short time renew this gravel supply and it can again be removed and sold. During the interval of time that the gravel is again filling in around the intake, the hoist will be used to clean out the service well at the plant.

Another use will be found for it at a later date when the coal supply in the bins commences to run low. At present the coal cars are being dumped so that the coal is deposited along the side hill above the plant in anticipation of a shortage this winter. When the bins become empty, the ever-ready hoist will be brought into service to pick up the coal and deliver it into the plant. A picture of the light plant on another page of this number shows the method of delivering coal to the plant.

Central Electric Power and the Smoke Problem.

The importance to densely crowded industrial cities of substituting great central electric power plants for scattered steam plants is suggestively touched upon in a recent paper by Professor Dugald C. Jackson, the newly-elected president of the American Institute of Electrical Engineers, from which the following is taken:

In the city of Philadelphia many tens of thousands of horse-power are used for manufacturing in establishments crowded together in city blocks, and the power is developed in separate large and small power plants located, as physical conditions warrant, in each establishment and with a minimum consideration given to economy. Several (perhaps three) large steam-turbine electric power houses, located on tide water aside from the densely occupied areas and constructed with a careful eye to minimizing the cost of the kilowatt-hour, could profitably supply this power at figures corresponding with its existing cost, and at the same time release for productive purposes large parts of the very valuable space now occupied by individual factory power plants. This would also relieve the thickly occupied parts of the city from the smoke and dirt that have become seriously objectionable, and would also remove the inconveniences now relating to providing the fuel supply and discarding the refuse.

Much is now being said of "city planning." Some of the proposals seem to be founded on pure altruism, but others are obviously founded on economy. The city planners of crowded industrial cities have an opportunity which joins economy with altruism in studying the applicability of electrical power from centralized generating stations to large and small industrial establishments. There is here an opportunity for the betterment of crowded larger industrial cities that ought not to be overlooked. It has its possibilities also in the smaller industrial cities. The possibilities are larger and more real than appear at first view. I lay this before you as one of the most important and desirable ways in which the proved applicability of electrical power to industrial establishments may be utilized for the betterment of crowded factory areas.

Oiling Brick Street.

In connection with the inquiry about the feasibility of oiling a brick street to keep down dust, which was printed in MUNICIPAL ENGINEERING, vol. xxxix, p. 113, the following anonymous report of experience will be of interest. It is taken from *The Improvement Bulletin.*

An Iowa man experimented with laying dust on brick pavement in front of his dwelling, and found that crude oil sprinkled upon the brick served to lay the dust for some time. Much of the oil was absorbed by the brick and the filler,

and served to make the street nearly dustless at that point. The experiment cost about $1.50 for the sixty feet frontage, including the wages of the men who applied the oil. The plans seems to be worthy of being followed up by further and more exhaustive experiments. If it can be shown that the dust can be laid for any length of time by this method, many merchants will be glad to have the paving in front of their places of business oiled, even if they have to bear a portion of the expense.

Pavement Crowns.

To Editor of MUNICIPAL ENGINEERING:

Sir—In a paper prepared on the above subject by the undersigned for the Convention of the American Society of Municipal Improvements held in Little Rock, Ark., in November, 1909, which was published in most of the engineering papers as well as the proceedings of the convention, the general rule was given, for monolithic pavements providing roughened or grainy surface, to provide crown ¼-inch per foot of width of roadway between tracks and that 1-3 of the fall be between crown and quarter and 2-3 between quarter and gutter. A rule in quite common practice is 1 inch crown in 5 or 6 ft. of width and ¼ of the fall between crown and gutter and ¾ between quarter and gutter. The paper gave variations for peculiar conditions such as steep grades, streets having railroad tracks or having curb on one side at a higher level than the other side of the street.

The effect of the rule suggested by the paper referred to as compared with flatter crowns in common practice is:

(a) To slightly raise the crown and consequently provide better flow of water to the gutter.

(b) To increase the ratio of fall from the centre of the roadway to the "quarter" point, thus overcoming the flat crowns holding water and causing deterioration, which is so common in street pavements.

These were the cardinal principles the paper intended to bring out. In discussion following reading of the paper, it was criticised as not providing points between the quarter and gutter and between the quarter and crown. While these "mid-quarter" points are quite unnecessary unless the streets are wider than 40 ft. the criticism of the omission was well taken and the writer replied as it now appears with unsufficient thought as follows:

With reference to suggestion, that my rule did not provide for grades intermediate between the quarter and the crown, or between the quarter and the curb. I must admit that my paper was faulty in that respect. With streets, say forty feet wide, I believe my rule is sufficient and no intermediate points are necessary or advisable. If the streets were of unusual width, the rule I would follow would be to first find the crown, and then find the quarter and intermediate points by highting across with a "T." If the street is of such width that you want intermediate stakes make the same divi,sion between the quarter and the curb as between the quarter and the crown; that is, let two-thirds of a total fall be in the half nearest the curb and one-third in the half nearest the crown."

Through private correspondence, Mr. G. B. Zahniser, C. E. of New Castle, Pa., kindly calls my attention to the fact (quite overlooked in my "off-hand" reply to the conditions above referred to) that this provides a "straight line from the crown mid-quarter point to the curb mid-quarter point." Mr. Zahniser agrees with the writer's cardinal rules above referred to, and as to mid-quarter points suggests the following rule, which the writer heartily endorses:

st drop, 1-8 the crown at the crown mid-quarter point.

2nd drop, 1-3 the crown at the quarter point.

3rd drop, 5-8 the crown at the curb mid-quarter point.

The writer's rule, thus modified by Mr. Zahniser, gives the following on a nearly flat street with roadway 80 feet wide between gutters on streets having no tracks:

Crown 20 inches above gutter.

First drop one-eighth of the crown at the crown-mid-quarter point, 2½ inches below the crown.

Second drop one-third the crown at the quarter point, 6 2-3 inches below the crown.

Third drop five-eighths of the crown at the curb-mid-quarter point, 2½ inches below the crown." GEO. C. WARREN,

President Warren Brothers Company,
Boston, Mass.

Action of Bituminous Expansion Joints.

To the Editor of MUNICIPAL ENGINEERING:

Sir: Referring to the article on page 118 of August number of MUNICIPAL ENGINEERING "A Little Bituminous Filler Story."

It occurs to me that the ridge at the expansion joints referred to by Mr. Kingsley may be from another cause than that to which he attributes it. I have never seen transverse expansion joints made by filling several narrow joints with bituminous filler instead of one wide one, but I know that where the wide joint is used, if the bituminous filler is a little cool when poured the top is sometimes filled without properly filling the bottom of the joint, and when expansion takes place the bricks next the expansion joint close in at the bottom, while they are held apart at the top by the filler and accumulation of dirt, causing the brick near the joint to bulge up considerably. It appears to me very probable that where the expansion joint is distributed over

several courses of brick they might rise up in the same manner. I think it probable that if Mr. Kingsley were to take up a section of the brick across the expansion joint he might find this to be the case, and that the brick with the bituminous filler are worn at least as much as those with cement filler.

E. WHITMORE, City Engineer,
Port Huron, Mich.

Expansion Joint in Concrete Pavements.

To the Editor of MUNICIPAL ENGINEERING:

Sir: We are in receipt of MUNICIPAL ENGINEERING, also of "Standard Paving Specifications," and we wish to say that if the specifications of the different pavements are as defective as specifications given in the laying of concrete streets, we are very much afraid that the information in said book will be very misleading, and prove an expensive proposition to contractors who may adhere to its teachings.

One of the most important features in the construction of concrete pavements is to take care of the expansion and contraction of the concrete laid on the street, and in reference to same, it states to fill the joints (made for the above purpose) with creosoted soft wood timber. Who ever heard of timber of any kind that would expand or contract with climatic changes? The idea is a ridiculous one and denotes the absence of thought on that subject. In corroboration of this statement, we wish to say that in one particular instance in the construction of a street of this kind in the city of Fond du Lac, the contractors in charge, by accident, omitted removing the boards, used for the purpose of creating the joint, with the result of having the pavement that came in contact with it, crack and go to pieces.

Our city engineer, Mr. McCullough, who, I believe possesses a superior knowledge relative to concrete construction work, his opinion being sought by the best engineers in the country, will, I believe, fully agree with our ideas in this matter

We note the use of expansion joints between the gutter and pavement running parallel with the same are also omitted. This being an absolute necessity, we would suggest that it be included.

To take care of contraction and expansion seems to be the pulse of the entire situation as to the virtue of concrete pavements, and a little good judgment is necessary.

Contractors are now in a position to make perfect joints of any size by the use of steel expansion wedges, and there is no excuse for extraordinary sized openings, heretofore caused by the use of boards, etc.

Trusting we will be pardoned if we have taken undue exceptions relative to this particular pavement, we beg to remain, Very truly yours,

THE NATIONAL CONSTRUCTION CO.
Per T. E. Dockery, Sec.

The book referred to, "Standard Paving Specifications," contains the specifications adopted by the Organization for Standardizing Paving Specifications at its first convention, held in Chicago in February, 1910. These specifications were provisionally adopted, for many members were not satisfied to be placed on permanent record as endorsing all the details of all the specifications, particularly because it was impossible for every member to examine carefully every specification presented. Several details have been criticised and that referred to in the above letter is, in the editor's opinion, open to the severe criticism given it by our correspondent. Just such criticisms from practical men are desired and any of our readers who wish to add to the number of criticisms are invited to send them in for publication and consideration. The second convention of the organization is called for January, 1911, to meet in New York City, and the eleven months of study which its members will have given the specifications by that time will undoubtedly result in the modification of such provisions as that above quoted.

A long step in advance is made by securing a set of standards vouched for, even though provisionally, by so large a body of the most expert municipal engineers, and when they have matured their judgments by the year of study of the first formulation of specifications, their work will probably be accepted very generally, subject, of course, to such modifications of some details as are required by local conditions.

The American Society of Municipal Improvements, which meets in Erie, Pa., in October, has also taken up the question of standardizing specifications, and is proceeding with greater deliberation. The specifications adopted at the Chicago convention last February and the criticisms thereof, will be open for consideration by that society. Both associations will be greatly aided in their work if engineers generally will express their ideas concerning the provisions already formulated, and will send in such as they feel should be included. MUNICIPAL ENGINEERING has for years advocated the course of procedure now started and wishes to aid in every possible way in promoting the cause. The best method of getting to the provisions that will be generally satisfactory is through public discussion, and the pages of this magazine are open to such discussion in any form which will aid in the advance.

Wide Tires the Remedy.

To the Editor of MUNICIPAL ENGINEERING:

Sir: On page 109 you say: "But heavy travel rapidly turns it (the earth road) to dust; water, beyond light sprinkling, makes mud." Yes indeed! Heavy traffic does make dust and mud of earth roads, and thereby positively precludes any state of ideal perfection.

But why use bad wheels—narrow tires—and so choose to have traffic so scandalously indecently heavy?

I enclose "talk" just published. Please help me to put the bull out of the china shop. If we can't do that, for heaven's sake let's stop talking about the broken china.

Yours for good roads for good wheels,
J. M. HEISKELL, Memphis, Tenn.

The "talk" referred to puts in Mr. Heiskell's unique way the case for wide tires, the substance of which has been printed in this department in communications from him. If all the advocates of good roads were as devoted and as persistent as he, the ideal condition of of roads would be more nearly in sight.

Calcium Chloride for Dust-Laying and Road Maintaining Purposes.

To the Editor of MUNICIPAL ENGINEERING:

Sir—The article and citation in the current issue of MUNICIPAL ENGINEERING on the use of calcium chloride for dust-laying and road maintaining purposes is in the main a very comprehensive and accurate statement of the facts and conditions of the use of this chemical; but you are at fault in two essential particulars. First, in the statement that the chemical will wash and waste seriously; and, second, that it will not wholly dry out.

I have used and experimented with this chemical extensively for the past two years on road treatments, and I think that I have discovered some properties and actions of it that were not heretofore known. To begin with, this chemical, calcium chloride, is virtually a chemical sponge, having the same action as a sponge in absorbing moisture to a complete saturation rapidly and in evaporating slowly to a condition of dryness. Like a sponge, if too freely or too long exposed to a very dry air condition, it will become dry and so cannot and will not give out moisture and therefore will not lay the dust.

A road properly treated with this chemical will not require one-tenth the water which an untreated road will, and the elements, rain, dew and moisture, contained in the air, will supply nine parts of this tenth. On the failure of the elements to give this natural supply, an artificial one must be given or the road will not remain dustless. If this artificial supply is given, the road will remain in a perfect condition at all times. The chemical is practically indestructible, thus insuring a constantly improving roadway with a rapidly decreasing cost. This is the exact opposite of all other forms of road construction and treatment.

Now as to the wash, this chemical is 80 per cent heavier than water, though soluble in it, and so cannot be lifted and made to flow with water. This explains the cause of the thick, syrupy solution so well described in the article referred to above. This syrup is the complete state of saturation of the chemical. It will not take any more water, nor will it wash with the water flowing over and around it. If it is impounded in the roadway, as per my method, it will not move unless pushed by some very strong force. It also has the characteristic of a leech. In the process of saturation it attaches itself to any substance that it comes in contact with and is removed only with very great difficulty. Hence its staying propensities. For example, a long section of hilly road was treated last year at Bloomfield Hills, near Pontiac, Mich. This section of road after it was treated was subjected to seven hard, drenching rains besides numerous lesser ones. It was also covered with snow during several weeks of last winter and spring, but after the snow had melted and the other parts of the roads had dried out this spring, every yard of the treated roadway could be picked out, even to the uneven lines along the border.

In the past two years we did not have a piece of our treated roadway dry out so as to become dusty under two to three weeks, so to be safe in our claims we cut our experiences in half and suggested in our circular the possible necessity of artificial watering once during a week or ten days. During the dry spell we have experienced these past two months we have had newly treated roads dry out and become more dusty in three days than those of last year did in three weeks, and in this same Bloomfield section. This experience has rather called our claims in the circular into question, but we felt when issuing the circular that we were on the safe side when we gave the time limit a margin of 50 per cent.

In the future we shall insist on a wetting of the chemical whenever conditions require it, if the people would have a perfectly dustless condition. To make this possible we are arranging with the Studebaker Bros. Co., of South Bend, Ind., to fit up a small watering cart with pump attachment for use where water under pressure is not obtainable, by which means the sprinkler can be filled from a well, cistern or running stream. We design also bringing out a specially equipped wagon from which a combination of this chemical and the road material can be taken to fill ruts or wheel grooves in the roadway, so that at times when the roads are damp and soft after the rains, a man will go over it with a wagon load of this combination and after having pushed the displacements into the depressions will fill them from the contents of the wagon, tamp same into place,

the chemical in this mixture insuring a perfect knitting and bond with the lower body. In this way you will have a roadway as smooth and even as sheet asphalt pavement without any of the slippery or dusty conditions of the paved street. One man and a horse will care for and keep in perfect condition from ten to fifteen miles of roadway per year. This is an accomplishment which is absolutely impossible with any other form of treatment or construction.

S. G. HOWE, Detroit, Mich.

Municipal Stone Quarry at Two Harbors, Minn.

To the Editor of MUNICIPAL ENGINEERING:

Sir—Replying to the inquiry signed "T. J. W., Milwaukee, Wis.," on page 33, Question Department of MUNICIPAL ENGINEERING for July, 1910, asking in regard to municipal stone quarries and crushers, I wish to say that this city has just completed the erection of a rock crushing plant and opened a quarry in connection with same, and we are now crushing rock which is being used for macadamizing streets in this city.

We have one No. 5 Austin-Western gyratory crusher operated with one 40-horsepower, 1-phase, 60-cycle, 220-volt Wagner motor; a 52-foot elevator and a 14-foot revolving screen, both operated by one 20-horsepower motor of same make and style. Our screen has ⅜, ¾, 1¼ and 2½-inch perforations. We have a spout so that we can either run the rejections back through the crusher by gravity or allow them to go in with the 2½-inch size.

Some items of cost have not yet been booked so that I can not advise definitely as to the total cost of the plant, including motors, transformers, etc., but estimate that it will be approximately $6,000. We have only been operating a little over two weeks so can not furnish information as to the cost per yard for quarrying and crushing.

F. E. EVANS,
President City Council and Purchasing Agent for the City.
Two Harbors, Minn.

Permit for Use of Fire Hydrant by Contractor.

To the Editor of MUNICIPAL ENGINEERING:

Sir: One of the vexing problems which confronts Water Works Superintendents is that concerning the use of public fire hydrants for building and contracting purposes. It often happens that irresponsible persons are allowed by their employers to operate hydrants where water is sold for building and other purposes, and when one of these hydrants is broken through ignorance or perhaps carelessness, the parties responsible for the breakage fail to report same for fear of reprimand or of being charged for the amount of repairs. After experiencing considerable trouble of this character, we think that we have solved the problem by using what may be termed the Contractors' Hydrant Contract, copy of same herewith attached. These contracts are gotten up on the order of a check or requisition book, with each contract and corresponding stub numbered consecutively. We have introduced this plan this year in our own department and it is working to our entire satisfaction. These suggestions may be of use to some who have had this same trouble to contend with.

A. C. GRESSLE,
Supt. City Water Works, Hamilton, O.

No.....

CONTRACTOR'S PERMIT.

This is to certify that....., the holder of this permit, is hereby authorized to use ONE Public Fire Hydrant located at.....St., for a period of.....days. This permit is granted upon the payment of $1.00 to cover cost of inspection. The following conditions must be observed:

Said..... will be wholly responsible, and will pay for any damages resulting from his use of said hydrant.

Contractor also agrees to notify the Hamilton Water Department immediately after through using above named hydrant.

That he will conform strictly to the rules and regulations of the Hamilton City Water Department.

That he will, during his use of said hydrant, keep same in an accessible condition for the City's use, and will never at any time take water from the above hydrant unless meter is used to determine the amount of water used.

This permit is VOID if any other than the above named hydrant is used, and any violation of the above will subject the offender to a penalty of $10.00, to be paid at the office of the Hamilton City Water Works.

WATER WORKS DEPARTMENT.
Per....., Supt.
....., Contractor.

The editor is strongly opposed to the use of fire hydrants for other purposes, believing that special hydrants for commercial purposes, as well as for street and sewer flushing, sprinkling, etc., are much safer and more economical, all things considered. If, however, such uses of fire hydrants seem to be permissible (they are seldom necessary), the above makes it easy to place the responsibility for damage to the hydrant itself. There is an opportunity for dispute as to whether damage developing during a contractor's use of a hydrant results from his use of it, and the use of the phrase "developing during" instead of "resulting from" would prevent any controversies in case a hydrant were used by two or more contractors in succession.

Will our readers report their practice in this regard?

Regulation of Use of Public Baths.

Several inquiries for sets of rules and regulations for the use of public baths have been received. The following, established by the Board of Water Commissioners in the city of Erie, Pa., for the

control of the public free bath illustrated in the August number of MUNICIPAL ENGINEERING are published in accordance therewith:

The cabinets and the swimming pool can be used by the public during week days until 8 o'clock p. m., and on Sundays until 9 o'clock a. m.

Tuesday and Thursday afternoons and evenings will be reserved for women and girls.

All bathers are required to wear bathing suits.

The bathing master will be at the pool from 8 to 12 o'clock a. m. and from 1:30 to 8 p. m. All children must bathe between these hours. Bathing parties consisting of young boys and girls may bathe at any time during the above mentioned hours, if properly chaperoned.

The maximum time in the swimming pool must not exceed forty-five (45) minutes and all unnecessary delay by lingering in and about the cabinets is prohibited.

A quiet and gentlemanly deportment will be insisted upon at all times in and about the swimming pool.

All bathers unable to swim should enter the water at the south end, where it is 2 feet deep, or in the middle, where it is 4½ feet deep, and never at the north end, where the depth is 7 feet.

The use of tobacco, spitting in the water or on the floor, the use of soap in the pool, any injury to the property, scratching or scribbling on the walls are strictly prohibited. Soap must be used in the shower room only.

The water commissioners will not be responsible for any loss of private property in or about the swimming pool.

Persons wishing to learn to swim can make the necessary arrangements with the bathing master.

The space between the cabinets and the pool is to be occupied only by bathers and their attendants.

By order of the commissioners of the water works in the city of Erie.

GEO. C. GENSHEIMER, Secretary.

MUNICIPAL MATTERS IN COURT

Higher Courts—Water Pollution Suit—Chicago Shale Rock Case—Borough Water Contract—Dual Water System—Limit of Indebtedness and Purchase of Water Works.

Decisions of the Higher Courts of Interest to Municipalities.

Eminent Domain — Property Outside Necessary Lines.—St. 1902, c. 534, being an act to provide for the construction of additional tunnels and subways in the city of Boston, by section 6 authorizes the taking by the Boston Transit Commission of lands in fee and easements, including the right to go under the surface or through or under any buildings, and provides that the taking may be confined to a section of a parcel, fixed by horizontal planes of division, below, above or on the surface, when the upper or lower portions need not be taken, except such easements therein as the commission may deem necessary. Section 7 authorizes the commission to sell or remove all buildings from land taken, and to sell, if practicable, and, if not, to lease, any interest taken, whenever it ceases to be needed for such purposes. Held, that the Legislature could provide for the taking of land with a reasonable regard to economy; and since a taking in fee of land outside the limits of the tunnel, which might be seriously injured during the work, might be more economical than the taking of only that which would be used permanently, the Legislature could authorize the taking of such land in fee and the disposal of that part not needed when the work was done, so that the act was not unconstitutional for so authorizing. City of Boston v. Talbot (Mass.), 91 N. E., 1014.

Changing Street Grades—Liability for Damages.—A municipal corporation is liable to the owner of property abutting on a street for changing the grade of the street only so far as damages arise from its doing the work negligently. Harper v. Town of Lenoir (N. C.), 68 S. E., 228.

Changing Street Grades — Supports for Abutting Property.—Where a change of street grade involves an excavation of 12 or 14 feet, leaving abutting property on an embankment of that height nearly perpendicular, and with a soil that will not stand in any such shape, proper care requires the municipal corporation to provide some kind of proper support therefor. —Id.

Change of Street Grade — Measure of Damages.—While the general and better rule of damages for injury to abutting property from negligence of a municipal corporation in making a change of street grade is the impaired market value of the property, the cost of a retaining wall is relevant to the inquiry, and under some

circumstances may be adopted as determinative, particularly where such cost is reasonable, and operates in restriction of amount of recovery.—Id.

Public Improvements — Sufficiency of Specifications for Foundations, Catch-Basins and Curbs.—Committing to the street superintendent's judgment or volition the determination whether, according to the condition of the earth, "crushed rock" or "selected earth material" should be used in the preparation of the foundation for a street improvement, was only a reasonable and necessary discretion to vest in him, since the determination thereof necessitated investigation to ascertain whether the soil was naturally soft or yielding so as to require crushed rock or selected earth material according as to the extent of that quality which it possessed, or whether it was naturally sufficiently compact in itself to require neither of such materials, and a provision in the specifications, giving the superintendent such authority, was not on its face a delegation of an unauthorized power to determine the cost of the improvement, fatal to the assessment. A provision in specifications for a street improvement which minutely describes a catch-basin, both as to size and materials to be used, cannot, in the absence of evidence showing positive injury to have actually resulted therefrom, be held insufficient as delegating power to the street superintendent to fix the cost of the improvement, because it fails definitely to fix the point at which the catch-basin should be located. Specifications for such improvement need not specifically locate the line of the curbs and gutters, it being common knowledge that they must be placed at one of the edges of the street fixed by official survey. Burns v. Corsly et al (Cal.), 109 Pac., 94.

Change of Grade of Streets—Damages and Benefits.—The benefits resulting to abutting property from a change of grade of the street must be considered in connection with the disadvantages resulting therefrom in determining the measure of damages to abutting property. Meardon v. Iowa City (Iowa), 126 N. W., 939.

Water Rates.—A water ordinance providing a fixed scale of minimum charges for water supplied to dwelling houses, based on frontage width up to 50 feet and height up to and including five stories, the rates being increased $1 for each additional story, etc., and being apportioned on the basis of one family to a house and one closet and bath to each house without extra charge, an additional charge being made for each additional family, and providing that all charges not mentioned or fixed are reserved for special contract, did not on its face apply to an apartment house seven stories high, with a frontage of 45 feet. In re Herrman (N. Y.), 123 N. Y. Sup., 752.

Street Improvements — Conformity to Resolution.—A tax bill for macadam 6 inches deep is void where the initial resolution and proceedings had until expiration of the time for remonstrance against the improvement provided for 4 inches. City of Poplar Bluff v. Bacon et ux. (Ark.), 129 S. W., 466.

Special Improvements—Breach of Contract—Right of City to Recover.—A city which has sustained no loss cannot recover on a sewer contractor's bond the excess it is compelled to pay another contractor in special tax bills on the first contractor's failure to perform his contract, regardless of whether it styles itself trustee for the special taxpayers injured. City of St. Louis v. Anderson et al. (Mo.), 129 S. W., 528.

Right to Connect with Sewer.—Where a sewerage company was organized to build a sewer in certain territory and to rent the right to connect with the sewer, and about one-third of it was built on private property, the courts might require the company to permit a landowner to connect with the sewer for a consideration prescribed by the courts. Pulaski Heights Sewerage Co. et al. v. Loughborough (Ark.), 129 S. W., 536.

Assessment District for Street Improvements Must be Entirety.—Inclusion of two district sections of a city, separated at their nearest points by nearly one-half mile, in an assessment district for district street improvements, is not authorized by the local improvement act of February 26, 1901 (St. 1901, c. 38), which authorizes the inclusion of "one or more streets in the same proceeding," such provision applying to improvements constituting an entirety. Southwick et al. v. City of Santa Barbara et al. (Cal.), 109 Pac., 610.

Power to Issue Refunding Bonds.—Under the provisions of section 2315, Rev. Codes, a municipality has the authority to issue refunding bonds for the purpose of redemption of outstanding indebtedness when the same can be done to the profit and benefit of the municipality, and this may be done without the submission of the question of the issuance of such bonds to the electors of the municipality. Veatch v. City of Moscow et al. (Ida.), 109 Pac., 722.

Water Rents—Enforcement of Collection.—Municipal corporations in Ohio are authorized to construct water works and to supply water to their inhabitants, and to collect money for water supplies, and to make such by-laws and regulations as they may deem necessary for the safe, economic and efficient management and protection of the water works. Under this power a regulation providing that, if any party shall refuse or neglect to pay the water rent when due, the water shall be turned off and not turned on again until all back rent and damages shall be paid, and the further sum of $1 for turning on and off the water, is a reasonable regulation and may be enforced. City of Mansfield v. Humphreys Mfg. Co. (Ohio), 92 N. E., 233.

Restraint of Collection of Water Rates

— Determination of Amount Due.—The determination by the proper city officials of the amount due for water supplied is not final, but the consumer who has good grounds for disputing the correctness of the charge made by the city may apply to the courts to determine the amount due and to restrain the enforcement of the rule pending such determination. Id.

Municipal Fire Protection — Effect on Contract — Liability for Fire Loss.—A contract requiring a water company to afford as effective service for fire protection for a city as furnished another only bound the company to use reasonable care to furnish service as near the efficiency of service in the other city as 6-inch pipe would permit, where that dimension was agreed upon in consideration of a reduced hydrant rental, instead of 8-inch pipe, as used in the other city. A water company contracting to furnish water for fire protection is not liable for municipal property burned through the company's failure to furnish an adequate supply, in the absence of an express undertaking to furnish protection to such property. Inhabitants of Milford v. Bangor Ry. & Electric Co. (Me.), 76 Atl., 696.

Public Improvements — Liability for Cost—Setting Curb Under Order.—Provisions of a city charter as to the assessment of damages and special benefits from public improvements, and requiring notice of assessments, have no relation to orders passed under provisions that, if any proprietor shall neglect to curb a sidewalk or gutter when directed by the court of common council, the latter may cause the same to be done, and order it to be paid by the proprietor. City of Meriden v. West Meriden Cemetery Assn. (Conn.), 76 Atl., 515.

Contract—Construction—Extra Work.—Where the plans and specifications for the construction of a bridge for a city, on which bids were invited, recited that the site would be carefully surveyed and marked on the ground for examination by borings made on the center line of the structure as shown on the plans, and that the foundations for the abutments and piers should be carried to solid rock, and the plans showed five borings and indicated the different kinds of soil to be encountered in excavating for foundations as shown by the borings, and upon acceptance of a bid the bidder proceeded with the work and encountered rock which it was necessary to remove which had not been indicated, the bidder was entitled to compensation for the extra expense involved, unless the right to such compensation had been abrogated by the provision of some contract between the parties after the bids were made. Capital City Brick & Pipe Co. v. City of Des Moines (Iowa), 127 N. W., 66.

Acceptance of Contract Price—Extra Work—Settlement of Claim.—Where the liability of a city on the final estimates for the contract price of a bridge could not be in any way affected by a claim for extra compensation, the payment by the city and acceptance by the contractor of the contract price did not amount to any settlement of the claim for additional compensation. Id.

Ordinance Regulating Water Companies —Meters at Company's Expense.—Under Kirby's Dig., secs. 5442, 5445-5447, which give municipal corporations the power to provide and regulate a water supply and authorize the city council to fix reasonable prices to be paid for water, and to require the water company to adopt such rates, an ordinance establishing maximum rates for the use of water, but providing also that in no case was measured water to be furnished at less than a certain sum, and that if the company was dissatisfied with the flat rate it could, after installing and connecting a meter at its expense, require the consumer to pay for measured water at the fixed rates, was valid; the provision permitting the company to install a meter and to require the consumer to pay at the rates fixed for measured water being but a means of regulating the distribution and "supply of water," and of fixing the price that should be paid therefor. Where an ordinance permits a water company, if dissatisfied with the flat rate, to install meters at its own expense and to require consumers to pay for measured water, the consumers cannot be charged with the cost of the meters. Wilson Water & Electric Co. v. City of Arkadelphia et al. (Ark.), 129 S. W., 1094.

Ordinances Regulating Water Companies — Meters at Whose Cost.—Under Acts 1905, p. 700, providing that owners of companies for furnishing water to the general public in cities of the first and second class, if they furnish meters for the purpose of measuring the water in cities of the first class, they shall be furnished upon demand without charge, etc., city councils of cities of the second class are not prohibited from passing ordinances requiring water companies to furnish meters to their patrons at the expense of the companies, nor from passing ordinances requiring patrons of water companies who demand meters to pay for them. Id.

Injunction Against Smelting Company for Water Pollution, is Adjusted.

The injunction suit of Hugh Magone against the Colorado Smelting & Mining Company and others, was decided by Judge Hunt in the federal court, holding that Magone cannot recover for injury done his farm by polluted water, which he, as a subsequent appropriator, voluntarily and with knowledge of the nature of the use by prior appropriators, took out of the Deer Lodge river and spread on his lands by means of ditches. But the court holds that Magone can recover from the defendants for the overflowing of the lands and the settling of debris thereon. Land taken in this way amount-

ed to 39 acres, and the damage is fixed by the court at $572.50.

Under the prayer of the complaint the defendants will be allowed to escape from injunction, provided they pay to the complainant within the next sixty days, the sums estimated by the court as compensation, in lieu of a cessation of the trespass. This alternative decree follows a decision of the Supreme Court of the United States. If the sums are not paid within sixty days, injunction will issue.

Shale Rock Case Fails at Chicago.

M. H. McGovern, the contractor indicted on charges of grafting from the city in the "shale rock" scandal, was cleared when Judge Barnes refused to allow his case to go to the jury. Judge Barnes had already taken the cases of Paul Redieske, former deputy commissioner of public works, and John Ericson, city engineer, who were indicted on the same charges, from the jury. The state announced it would non-suit the case against Ralph A. Bonnell, former assistant city engineer, but the defense objected, and Judge Barnes instructed the jury to find him not guilty.

New Jersey Borough Water Contract Void.

In the certiorari proceedings brought in the Supreme Court by John A. Bayliss and others against the mayor and council of North Arlington and the mayor and aldermen of Jersey City, N. J., to review a resolution and contract of North Arlington, whereby it attempted to obtain a water supply from Jersey City, Justice Trenchard filed an opinion in the court, setting aside the resolution and contract with costs. The prosecutors of the suit contended that neither North Arlington nor Jersey City had legal authority to make such a contract.

Justice Trenchard states in the opinion that the only authority to execute such a contract is in the State laws, which provide that it shall be lawful for the governing body of any municipal corporation to make contracts "with any adjoining corporation" to supply it with water.

In the present case it appeared that North Arlington is about five miles from Jersey City. The opinion holds that the laws referred to give such rights only to municipalities whose corporate territories are contiguous.

Effect of Limitation of Indebtedness on Municipal Acquisition of Water Works.

Judge Endlich of the Common Pleas Court of Berks county has rendered a decision regarding the acquisition of the plant of the Fleetwood Water Company by the borough of Fleetwood which shows the action of the laws of Pennsylvania in such cases. Under the act of 1907, the borough had petitioned the court for the appointment of appraisers for the plant, an appraisement was made and the company objected to the continuance of the proceedings on the ground that the indebtedness of the borough resulting from the transaction would exceed its constitutional limitation. The court cites sections 5 and 6 of the act, P. L. 355, 1907, which provide that the payment for the water works shall be out of a sinking fund derived from the revenues of the plant only, thus not increasing the general indebtedness of the city. The constitutionality of the act as applied in the case is discussed and affirmed and the proceedings for completing the transfer are permitted to continue.

Quincy Favors Commission Form of Government.

At a meeting held in Quincy, Illinois, on July 29, a movement was started to place that city among those having the commission form of government. The movement was started by the Chamber of Commerce and is not in the slightest degree partisan.

Briefly the commission form of government is that of a city conducted by a commission, consisting of a mayor and four commissioners to take the place of the city council, as has been the form in the past. Under the law of this State the referendum, initiative and the recall features are carried in the law. The mayor and commissioners serve in office for four years, with the mayor drawing a salary of $3,600 per year or less, and the commissioners drawing a salary of $3,000 or less. The mayor is to be made what is known as the superintendent of public affairs, and at the first meeting of the commission after election the members of the commission agree among themselves which one will have charge of the following other departments — one commissioner to be in charge of the department of public accounts and be superintendent thereof, one to be in charge of the department of public health and be superintendent thereof, one to be in charge of the department of public improvements and be superintendent thereof, and one to be in charge of the board of public property and to be superintendent thereof. The park and school systems do not fall under the jurisdiction of the commission.

Cement Exports and Imports.

The importations of foreign cement has declined from 1,509,047 barrels in the year ending June 30, 1908, to 506,151 barrels for the corresponding year in 1909 and 429,215 in 1910. At the same time exports have increased from 945,421 barrels in 1908 through 827,971 in 1909 to 1,715,169 in 1910. The greatest reduction in imports was in English cement, but this was in part offset by a material increase in the importations from Canada.

WATER AND LIGHT

Dual Water System in Ft. Worth—Concrete Water Tank—Electrolysis Legislation—Leakage in Tunnels—Sterilization of Water —Minimum Charge for Gas

Fort Worth Adopts Dual Water System.

Fort Worth, Tex., has just completed the installation of a dual water system. The old system consisted of a chain of artesian wells, from which the water was pumped for all purposes. There was an emergency intake at the Trinity river for use in case of need, but the artesian water only was used, except in the case of an unusually large fire. The new system consists of a separate line of mains drawing their supply from the Trinity river. These mains are laid only in the business district and are connected to fire hydrants, water troughs and public fountains and later all hotels, public buildings, garages, livery stables and other large consumers will be expected to use the water for flushing purposes.

A rate of 10 cents per million gallons has been adopted with a view to determining the rate to be charged later. Consumers are not required to sign a contract for a longer period than 90 days, until a permanent rate is determined. By the 10-cent rate, if it proves feasible, Fort Worth compares favorably with the larger cities of the East and it is probable no other city in the South or Southwest has as low a rate. So large will be the capacity of the system that it was realized at the first estimate that much more water would be pumped through this system than would be used by the fire department, and the connections with private consumers were decided upon as a means of reducing the expenses of operating the system.

A Circular Reinforced Concrete Water Tank.

Mr. H. F. Blomquist, city engineer of New Ulm, Minn., describes the method of constructing and waterproofing a 1,000,000 gallon circular water tank constructed in that city. The tank was 75 feet in diameter and 30 feet high, and is covered with a conical concrete roof.

As the soil where the tank was constructed was of a hard clay, the base of the tank was placed upon it in the following manner: Upon the excavation made for the base was spread a 12-inch layer of stone, upon which was poured a wet, fine-grained concrete. This floor was reinforced with expanded metal of No. 16 gauge thickness and 3-inch mesh. The floor is bonded to the walls by 1-inch steel rods placed at 12-inch intervals throughout the circumference and bent so as to be imbedded 4 feet in the floor and 4 feet in the wall.

The walls are 20 inches thick at the bottom and taper to 15 inches at the top, with the batter on the outside. They are reinforced with 123 1⅛-inch and 40 1-inch round steel rods rolled to the required radius and placed horizontally, and by 20 upright supports made of steel angles with lacing bars, which served as supports for the horizontal rods during the time of construction, as well as vertical reinforcement in the walls. The horizontal reinforcement is sufficient to take all the stress without assuming tension in the concrete, or counting on the support of the earth embankment on the outside.

The roof is a conical slab of concrete 3 inches thick and reinforced with No. 12 gauge, 3-inch mesh, expanded metal, and it is supported by eight steel trusses radiating from the wall to a center pillar.

Especial care was taken to secure a waterproof tank. All material was carefully graded and smooth pebbles were used in the place of broken stone, as it was believed that broken stone tended to cause voids. In bonding old to new work the old surface was carefully cleaned and a neat cement grout was poured on before the new material was applied. To reduce the permeability to a minimum, 20 pounds of hydrated lime was used to every barrel of cement. After completion the walls were brushed clean with steel brushes and a cement plastering was applied, consisting of one part of cement, two parts of sand, 10 per cent of hydrated lime and 3 per cent of Medusa waterproofing compound.

No leaking has been reported since the reservoir was completed with the exception of a small, unimportant leakage in the floor due to an imperfect bond between some new and old material.

British Legislation Relative to Electrolysis.

In Great Britain all power of granting franchises is vested in Parliament and all laws affecting public service corporations are made by Parliament. In connection with the granting of franchises and rights the government enforces certain rules which have to do with the proper operation of the companies' privileges. Electric franchises contain certain rules relative to electrolysis which are in effect as follows:

1. The electrical power shall be used only in accordance with the Board of Works regulations, and in such regulations provision shall be made for preventing fusion or injurious electrolytic

action of or on gas or water pipes or other metallic pipes, structures or substances and for minimizing as far as is reasonably practicable injurious interference with electric lines and apparatus of other parties, whether such lines do or do not use the earth as a return.

2. When the return is partly or entirely uninsulated, a continuous record shall be kept by the company of the difference of potential during the working of the railway between points on the uninsulated return. If at any time such difference of potential between any two points exceeds the limit of 7 volts, the company shall take immediate steps to reduce it below that limit.

3. Provision is made for an adequate system of rail bonding and return feeder circuits to be maintained. Further provision is made that if any uninsulated return rail is within 3 feet of an uninsulated conductor, it shall be bonded to the conductor at distances apart not to exceed 100 feet.

4. A penalty of 10 pounds is provided for each offense against the provisions of the act and a further penalty of 5 pounds for each day during which the provisions of the act are ignored after notification of trouble.

The Prevention of Leakage in Pressure Tunnels.

In the construction of the great Catskill water supply system for New York City a great many types of aqueduct are necessary to conduct the water. In those parts of the line where it is necessary that the water shall be conducted under pressure, the problem is especially difficult. For such sections there were three forms of construction available, namely, steel pipe, reinforced concrete pipe and pressure tunnel construction. The construction of the latter type, with the methods to be used to prevent leakage into and out of the tunnel, is especially well covered in a paper by Mr. Thomas H. Wiggins before the Municipal Engineers of the City of New York.

It is recommended in all cases where pressure tunnels are constructed, that the weight of rock above the tunnel shall be such as to more than equal the internal upward pressure which will be developed, even if the latter spread out indefinitely sufficient time for purification. This asundiminished. The circular shape was adopted at the outset for pressure tunnels because of the external pressure which the tunnel may be called upon to carry when under construction or out of service. This external pressure is due to ground water and is dependent upon the relative porosity of the rock and the concrete. The process of grouting is intended to overcome some of this external pressure as well as to guard against inward or outward leakage. At the same time the grouting will serve to stop leaks which might otherwise relieve the unequal pressure. It was to overcome the porosity and external cracks in the rock as well as to afford a means of equalizing the pressure that the system later described was adopted. The tunnel lining was designed to withstand the whole ground water head, and the grouting is to be forced in between the lining and the outer rock. As Mr. Wiggins states it, he prefers to think of the lining "as a smooth coating to produce a high coefficient of flow and a bulkhead serving temporarily to retain the grout and enable it to be forced into the voids in the rock, the rock being thereafter the main water stop."

The problem of grouting is identified with taking care of the incoming water during concreting. All such water must be kept from the fresh concrete and carried through the forms in pipes. These pipes afterwards serve to conduct the grout to be forced through and back of the tunnel lining. The grout serves to fill the voids around and over the arch, but in the case of dry, impervious rock surrounding, the grout may be omitted without serious loss, if suitable sweepers are constructed to equalize the pressure on the inside and outside of the lining. The filling of crevices and holes in the rock through which ground water enters is of great importance, since water can escape wherever it can enter and in much greater quantities, because the unbalanced heads are much greater.

In grouting, cut-off walls are established every 50 feet, in all types of tunnel, extending from the lining to the roof. These walls prevent the grout from following its own whim in spreading to other parts of the tunnel rather than filling the interstices as intended. It is the intention to grout each leak through an individual pipe, so that each leak requires one connection direct to the surface of the form for the grout pipe and another to a collector set in the lining and communicating with the interior through weepers. Vent pipes must be provided for the air which is forced out by the introduction of the grout.

There are two types of machines for forcing the grout into place. One type consists of a tank which weighs only 500 pounds when empty, but is designed to stand 600 pounds test pressure. The grout is mixed in this tank by admitting air at the bottom, so that there are no revolving parts to become worn out through use. The grout is forced out by admitting air under pressure at the top of the tank and opening a 2-inch valve at the bottom. The second type machine is for use in forcing grout into porous lining, and is called the "pad grouting machine." It consists of 15x20-inch steel casting, flat and with the center dished. Around the central hollowed portion is a rubber gasket to permit of the grout being held in place when the casting is forced against

the surface to be treated. The casting is mounted on a hollow steel column which may be raised by means of two jacks that work against a cast iron bearing base. Both machines were designed by Mr. W. L. Cariff, who had charge of the grouting of the Cincinnati tunnel.

The Sterilization of Water.

The question of the sterilization of water is one which is occupying a great deal of time and attention of public officials. In New York in particular, where the great Catskill water supply system is being worked out, is the question being thoroughly discussed. Mr. Nicholas S. Hill, in a paper before the municipal engineers of the City of New York, takes up the matter in its different phases. His paper is too long for presentation here, but some of its features will be discussed.

The physical properties of water which affect its attractiveness are color, odor, turbidity, taste and hardness. The removal of pollution increases the attractiveness by the removal of the color, odor and turbidity and sometimes the taste and hardness. Microscopic organisms are sometimes responsible for odors and tastes which are not necessarily injurious. Only chemical, bacteriological and microscopical examinations of the water will serve to decide if it is really injurious to health.

The purification of the water supply, in addition to precautionary measures with regard to sewage discharge into the source of water supply, requires some means of removal of danger due to isolated infection, such as that from discharge from farms along the source of supply. The method recommended is by means of filters. The filters described are of the two types, the slow filter and the rapid or mechanical filters. In the former the water passes down by gravity through beds of sand of certain depth and is restricted as to velocity. In this case the suspended water, including most of the bacteria, is retained upon the surface of the sand, while a portion of the organic matter in the water is converted by chemical action into inorganic compounds. The process of rapid sand filtration consists in passing water downward at a rapid rate through small beds of sand, a certain amount of coagulating material having first been introduced into the water to assist in catching and holding the bacteria and suspended matter. This coagulating agent is usually sulphate of alumina. The rapid filter with its chemical action is said to bring about a higher chemical purification than the ordinary slow filter. The cost of filtration varies from $6 to $11 per million gallons including operating cost and fixed charges. On a basis of 70 gal. per capita per day for domestic uses, this would amount to only $0.281 per capita per year.

Another method of purification consists in allowing the water to stand in a reservoir or sedimentation tank to allow the natural process of purification to act. It is important in such a reservoir that the water should have a free circulation, in order that the water may not simply flow from inlet to outlet without allowing suring of thorough circulation will lessen the chance of plant growth along the sides and bottom of the reservoir.

The two processes, filtration and natural purification, should be supplemental and co-ordinate. When it is absolutely necessary to use the stored surface supply system alone, proper care should be exercised to prevent isolated nuisances. The reservoir site should include strips of land surrounding the basin and such land should be graded with a view to preventing danger from small communities, farming sections or initerant population.

The charcoal means of water purification, when the sole means employed, is not to be encouraged. The chemical method though cheap is effective only as a disinfectant. The method employed usually consists of adding chloride of lime or hypochlorite of sodium. There is some controversy as to whether the oxygen liberated from the hypochlorous acid or chlorine is the active disinfecting agent. These questions, however, are not pertinent, as the purifying effect is present and is recognized. The process is in the experimental stage and as yet it is not known if the amount of hypochlorous acid or free chlorine present in the water as delivered, may be sufficiently high to cause inhibitive action in digestion in the human stomach. On the other hand, so small a quantity of chemical as to remove all chance of danger to the human digestion would have little or no effect on the pollutions in the water. Water treated chemically should be stored so as to allow of the natural removal of free chlorine. The cost of the use of chlorine in purification plants is not known, but it costs between 75c and $1 per million gallons of effluent coming from septic tanks and sprinkling filter sewage purifiers.

The application of chemicals advisedly and with a proper consideration of their real functions will mark a great advancement in the purification of public water supplies, but they should be used in connection with chemical precipitation and sedimentation or filtration.

Determining Minimum Charge for Gas.

The Railroad Commission of Wisconsin in connection with the petitions of the Green Bay Gas and Electric Company for authority to increase rates, has used a very thorough method of analyzing the matter of minimum meter rate for gas. The company complained of the annual loss due to the large number of customers whose bills were 10, 15 and 25 cents per month. The company felt that it was an

unjust burden to be compelled to maintain meters and make installations in such cases. The company submitted an analysis of cost which is here reproduced. The analysis is made on the basis of a 5-light meter at $7.25 meter cost and $4 service investment.

TABLE I.

AVERAGE COST PER METER.

Resulting From or Attendant Upon the Maintenance of Meters Upon Consumers' Premises.

General and office expenses	$1.630
Registering and collecting	.187
Consumers' premises expenses	.389
Meter repairs and connections	.362
Service expenses	.295
Miscellaneous	.071
Bad accounts	.041
Taxes	.711
Depreciation (5 per cent on $7.25 per meter)	.362
Legal expenses	.072
Interest (6 per cent on meters and services)	.675
	$4.765
Interest (gas department's proportion of 5 per cent bonds issued)	4.900
Total cost per meter per year	$9.665

The company showed by an itemized table of customers' expenses that while the consumers were only assessed $5 for a service connection, the cost of installation was $9, and that the cost of the meter was $7.25. On the basis of this table it was shown that the amount which should be covered by minimum charge would be about $3.65 per annum or 30 cents per customer per month.

It would appear from this that the minimum charge should be 30 cents per month, but this charge would fail to cover the cost of any of the gas actually delivered to the consumer. The general practice is to levy a minimum charge that is high enough to cover the consumers' cost as well as the cost of the gas that is used by the smallest unit or meter in service. The question was, therefore, to determine the amount of gas that should be covered by such a minimum charge. The basis for such a determination was a table, given below, which shows by months the number of small consumers and gross revenues derived from them in 1909.

From this table it is seen that the average income per meter per month is 22.4 cents, taking those meters registering from nothing to 59 cents. Following the same plan the average of those meters consuming less than 40 cents' worth, was about 10 cents per month.

In view of the above facts the company was authorized to add to its rate schedules a minimum charge of not more than 40 cents per month where only one meter is used, and of not more than 25 cents per meter per month where two meters are used, one each for light and heat.

Month.	Total customers.	Total meters.	Meters not registering.	0 to 9 cts. meters.	10 cts. to 19 cts. meters.	20 cts. to 29 cts. meters.	30 cts. to 39 cts. meters.	40 cts. to 49 cts. meters.	50 cts. to 59 cts. meters.	Total gas consumed, cu. ft.	Per customer, cu. ft.	Per meter, cu. ft.	Total revenue.	Revenue per consumer.	Rev. per meter.
January	1,029	1,121	291	Included in meters not registering.	184	226	127	154	139	2M,600	205.6	188.7	$244 62	$0.238	$0.218
February	1,071	1,175	457		6	227	140	174	171	227,000	211.9	195.0	270 56	.252	.231
March	986	1,108	406		2	219	126	177	178	214,900	218.0	193.9	246 62	.250	.222
April	1,015	1,173	395		6	234	105	223	210	239,900	236.3	204.5	261 83	.258	.223
May	1,084	1,227	408		19	242	93	252	222	262,000	241.8	213.5	304 84	.280	.248
June	1,141	1,241	501		12	274	61	236	157	202,000	177.0	162.7	258 14	.225	.208
July	1,126	1,187	531		12	303	41	197	113	182,300	161.9	153.5	219 10	.194	.184
August	1,067	1,145	469		9	248	45	219	155	197,600	185.0	172.5	259 44	.243	.226
September	926	1,004	379		6	189	58	197	175	196,900	212.7	196.0	242 62	.262	.241
October	916	995	319		13	189	104	176	194	223,800	244.3	225.0	245 04	.267	.246
November	951	1,009	357		14	181	119	168	170	217,300	228.5	215.0	252 72	.267	.251
December	1,089	1,183	422		21	243	126	179	192	215,300	198.6	182.0	240 94	.221	.203
Total	12,401	13,568	4,935		304	2,775	1,145	2,352	2,076	2,590,600			$3,046 47		
Average	1,033	1,132	411		25	231	95	193	173	215,883	210.1	191.8	$253 87	$0.216	$0.224

Washington's River Park Plans.

Plans for the improvement of Potomac Park east of the Pennsylvania railroad embankment and the deepening of the Washington channel of the Potomac river opposite Washington, D. C., have been prepared by Lieut. Col. W. C. Langfitt, Corps of Engineers, and approved by Gen. Bixby, chief of engineers. They are based on the appropriation of $180,000 for the improvement of the Potomac river contained in the river and harbor act approved June 25, 1910.

The present project for this general improvement was adopted August 2, 1882. Its object is the improvement of the navigation of the river by widening and deepening its channels, the reclamation of the flats by depositing on them the material dredged from the channels, the periodic flushing of the Washington channel and the establishment of harbor lines.

In the execution of this project there have been obtained by dredging, channels from 400 to 550 feet wide and 20 to 21 feet deep, through the bars in the Virginia channel and the Washington channel. The ruling depth is now 19 feet at mean low tide in Virginia and 21 feet in the Washington channel.

The tidal reservoir has been dredged and redredged to 8 feet, the present pre-

vailing depth. The reservoir outlet and inlet gates have been completed. A training dike, 5,965 feet in length, has been constructed in the Virginia channel above the Long bridge. About 35,541 linear feet of sea wall have been constructed around the reclaimed area.

The flats, by the river and harbor act of March 3, 1897, were declared to be a public park under the name of Potomac Park. That section lying westward of the railroad embankment, containing 300 acres of land and 111 acres of inclosed water area, has been filled to the full projected grade. It has been turned over to the office of public buildings and grounds, and developed by the latter office as a public park.

According to Col. Langfitt the work required to complete the existing project is dredging in the Washington channel, raising that section of Potomac Park (comprising 328 acres of land) lying eastward of the railroad embankment to the projected grade, relaying a portion of the masonry sea wall and the completion of the training dike. He says that maintenance work will be required from time to time in the removal of freshet accretions from the Virginia channel, but that no such work will be required in the tidal reservoir or the Washington channel above Arsenal Point, as the curtain gates at the inlet to the reservoir will be lowered to prevent freshet flow and sedimentation.

Adding an unexpended balance from previous appropriations there is now $186,000 available for the continuation of the improvement. Col. Langfitt says that money will be expended, beginning within the next three months, according to the following schedule:

Reclaiming that portion of Potomac Park lying eastward of the railroad embankment to the full projected grade by dredging in the Washington channel to the amount of 1,500,000 cubic yards, $143,000; repairing and relaying sea walls, $26,000; watchman, care of property, maintenance of outlet and inlet gates, etc., $2,000; contingencies, engineering, etc., $15,000.

SEWAGE AND REFUSE

Sewage in Fish Pond—Paris Garbage Disposal—Waterproofing Concrete Sewers—San Francisco Garbage Disposal—Vincennes Sewers

A Fish Pond Fed by Sewage Effluent.

Last year a pond constructed at Litchfield, England, was stocked with roach and perch, which appear to thrive in spite of the fact that the only water supplied is effluent from the city sewage works. The sewage contains a large proportion of trade waste and is treated on the septic system, with the addition of chemical precipitation at times when the raw material is very foul. The final effluent passes through a series of open troughs and is discharged into a small brook.

Regarding the fish pond, Mr. Chancellor, the city engineer, recently stated that while it may be admitted that fish will sometimes live in water of inferior quality not sufficiently good to be taken as a standard of purification in the case of sewage effluents, yet it is a distinct advantage to have a pond stocked with fish and be able to say when complaints are made about cattle being affected by the water that the fish are thriving.—*Ferro-Concrete.*

Garbage Disposal in Paris.

In Paris household refuse is set out in front of houses during the night in tin, zinc or galvanized iron cans or boxes, whence it is collected in the early morning hours by large wagons belonging to the municipality. For this service an ordinary family living in a flat pays a tax of about $11 per year. The wagons carry the rubbish to quays along the river Seine, where it is dumped through chutes to barges. Both while in the boxes along the streets and on the quay the refuse is worked over by chiffoniers, or rag pickers, who sort out and take away rags, paper and other articles, from the sale of which a large number of men, women and children gain a living in Paris.

There are several private establishments in the neighborhood of Paris for the salvage of bottles, glass, crockery, tin cans, bones, etc., but by far the most important of them is at Bondy, about eight miles east of Paris, on the Canal de l'Ourcq, which connects with the Seine. The establishment is owned and operated by a private company which was organized and took up the business after the government of Paris had failed in its attempt to destroy the city garbage by burning. The refuse landed at the wharves in Bondy is carefully picked over, and all rags, bones, old paper, tin cans, metal, glass, oyster shells, etc., which have escaped the hook of the chiffonier are taken out and assorted for separate treatment. The cans are cut up for tin, which is used in making toys, for which large quantities of this scrap tin

are sent to Germany. The rough bones are used as material for glue, the finer ones for making knife handles, buttons, dominoes, dice and other articles. Oyster shells, which are rich in lime and phosphates, are ground into powder, which is mixed with grain and other materials to make food for poultry. The remainder of the rubbish, which consists mainly of ashes and vegetable refuse, is pulverized and sold to farmers as a fertilizer. Owing to its percentage of potash it is too strong to be used alone; it is therefore mixed with barnyard manure.

The Effect of Waterproofing Compounds in the Permeability and Tensile Strength of Concrete.

The report of the commissioners of sewerage of Louisville, Ky., contains an account of an interesting series of experiments along the lines of permeability and tensile strength of waterproofed concrete.

The method used for determining the permeability of different concretes was similar to that employed in the Government laboratory for testing structural materials located at St. Louis. Specimens of concrete were made 10 inches in diameter and 4 inches thick. These blocks were placed between iron castings bolted firmly together in such a way as to allow the application of water under different pressures to a surface 6 inches in diameter. In order to provide water at definite pressure, an airtight iron tank containing filtered water was connected with another tank containing compressed air. The pressure was communicated from the air tank to the surface of the water in the other tank, from which pipes properly controlled by valves conducted water to the specimen.

These tests were made upon concrete, the constituent parts of which were so proportioned as to form a theoretically

TABLE I

Duration of Seepage Test, Seven Hours

Specimen	Cubic inches per sq. inch.	Cubic centimeters per sq. centimeter.	Gallons per sq. foot.	Total seepage in cu. centimeters.
Perfect mixture	1.53	3.99	3.22	7.21
Concrete (1:2:4)	6.30	16.6	13.85	310.00
Concrete with				
Clay 5 per cent	0.85	2.20	1.78	398.00
Clay 10 per cent	0.12	0.31	0.25	56.00
Concrete with				
Firesand 5 per cent	4.86	12.65	10.21	22.90
Firesand 10 per cent	1.20	3.12	2.51	565.00
Concrete with				
Hydrated lime 4 per cent	0.71	1.83	1.48	332.00
Hydrated lime 6 per cent	0.24	0.62	0.50	112.00
Hydrated lime 8 per cent	0.10	0.27	0.22	49.00
Concrete with				
Medusa 2 per cent	0.92	2.49	2.01	450.00
Medusa 4 per cent	0.0	0.0	0.0	0.0
Concrete with				
Maumee 4 per cent	0.23	0.61	0.49	110.00
Concrete with				
McCormick	0.17	0.44	0.36	80.00
Concrete with				
Ceresit	1.98	5.03	4.22	928.00
Concrete with				
Toxement 4 per cent	0.0	0.0	0.0	0.00

TABLE II.

Waterproofing Materials Used	How Added	Per Cent Used	Tensile Strength			
			Neat		Mortar 1-3	
			7 Days	28 Days	7 Days	28 Days
McCormick "A" from St. Louis	Combined at the mill		797	740	205	307
McCormick "B" local	Combined at the mill		513	577	199	220
Ceresite	In place of water	5	642	669	311	375
Molding sand	Used for sand	5	698	743	176	368
Molding sand	Used for sand	10	636	642	177	510
Hydrated lime	Added directly	5	749	651	387	511
Hydrated lime	To dry cement	10	608	635	371	505
Clay	In place of sand	2-5	753	787	235	344
Clay	In place of sand	5-0	718	912	221	401
Clay	In place of sand	7-5	644	802	344	327

perfectly graded mixture: Concrete, 1 part cement, 2 parts Ohio river sand, and 4 parts Ohio river gravel, 1:2:4, to which various commercial waterproofing compounds were added, and concrete in which a portion of the Ohio river sand was replaced by an equal portion of very fine sand and clay. Where hydrated lime, Medusa, Maumee and Toxement were used the amount added was a definite proportion of the quantity of cement used and the quantity of cement used was not reduced. The McCormick compound was mixed at the time of grinding, and the Ceresit was added to a portion of the water used in a proportion of 1 to 20.

Table I shows the results of the permeability tests. Further tests showed that the quantity of seepage was approximately proportional to the pressure applied and that there was no apparent cessation after an application of pressure for eighteen hours.

Table II shows the results of tests to determine the effect of waterproofing materials upon the tensile strength of neat and mortar (1:3) briquettes.

Specifications for New Incinerating Plants for San Francisco.

The department of public works of the city and county of San Francisco, Cal., has recently published specifications for the construction of two incinerating plants for disposing of the garbage of the city which contain some interesting provisions. The specifications were prepared by the city engineer, Marsden Manson, and Rudolph Hering was the consulting engineer. Ten pages of the book are devoted to statistics regarding the garbage and refuse collected in the city and their characteristics. Each plant is to have a capacity of 120 tons of mixed refuse per day of 24 hours, without additional fuel and to be reduced to a thoroughly hard burnt residue, innocuous and free from organic matter. The average temperature of combustion must be 1500 degrees and the minimum 1250 degrees. The general features of the apparatus are described. The bids are to state the total cost of construction complete in all details; the guaranteed net cost of incineration of the standard garbage (containing 1000 pounds of water and 460 pounds of combustible per ton in the furnaces); the decrease and increase in the net cost per ton for each pound excess or deficiency of combustible; the decrease or increase in net cost per ton for each pound increase or decrease in water per ton of combustible; the number of guaranteed pounds of standard garbage consumed per square foot of grate area for final combustion; the probable gross rate of evaporation in the boilers per pound of standard garbage. The lowest bidder will be determined by comparing sums obtained by adding 10 per cent of each total bid for construction of plant as fixed charges, to 40,000 times its guaranteed annual operating cost per ton of refuse.

Specifications for all parts of the plant are very complete, and the description of the method of test is more than usually detailed. Bonuses and forfeitures are provided for in case the cost of incineration is found by the tests to be less or greater than the bid or guaranteed cost, determined by multiplying the difference between the actual and guaranteed costs by the probable tonnage of refuse destroyed in three years, estimated at 120,000 tons at each plant, and provided that the difference shall not exceed 8 cents in either direction.

Municipal Construction of Sewers in Vincennes.

As it has been found unpopular to build sanitary sewerage systems in Vincennes by the plan of assessing each piece of real estate, the Board of Public Works has passed resolutions recommending that the council appropriate $100,000 to build the main trunk lines, reducing plant and pumping station. The council is in thorough accord with this plan and likely will make the necessary appropriation. After the trunk lines are built it is proposed to extend the sewers by districts.

Popular Form of Graft.

The man who tried to kill Mayor Gaynor of New York is not an anarchist, although some newspapers have so described him. He is a grafter of the type common in all big cities—the man who thinks he has done some work in politics for which the city owes him a living. The hardest strain the honest and courageous administrator of city affairs has to face comes from the friends of useless hangers-on, who, whenever it is proposed to cut off sinecures, raise a general chorus of "Aw, let the poor fellow alone; he needs the money! Give him a chance!" Gaynor has been striving to put the New York City government on a business basis, which meant cutting off the heads of hundreds of Tammany men who regarded their jobs as personal assets. If Gaynor should die, of which there is happily now but little danger, a new election might restore Tammany to power—so this fellow and his associates figured, and they seem to have talked the matter over in cold blood. The man who is giving honest measure of work for the wages he gets rarely has to worry about keeping his job. We sacrificed one President to the spoils doctrine, and Chicago lost a mayor by assassination from the same cause, and now the life of one of the best mayors New York ever had—for so Judge Gaynor has turned out—is in jeopardy. Civil Service has difficulties and drawbacks, but it is a thousand times better than this sort of thing.—*Pacific Outlook.*

CURRENT INFORMATION

Bloomington Paving—Chicago Paving Contract Losses—Wood Block in Berlin—National Highways—Milwaukee Municipal Reference Library—Town Planning in England

Bloomington, Ind., Starts Street Paving.

Martinsville and Bloomfield brick manufacturers were awarded the contracts by Bloomington, Ind., to furnish more than 1,000,000 brick for the first street paving to be done in the city. George T. Miller, of Lebanon, who has the contract to pave Walnut and Sixth streets, will use Bloomfield brick, and C. M. Kirkpatrick, of Kokomo, who is to pave College and Kirkwood avenues, will use the Martinsville product.

Loss in Chicago Paving Contracts.

The Merriam Commission reported to the Chicago city council on August 5th regarding the operations of Contractor McGovern whereby he received excessive compensation from the city in certain paving contracts made in 1908 and 1909. McGovern, it will be remembered, is the contractor indicted for the "shale rock" fraud on the Chicago sewer work, and cleared when the case came to trial.

In its report on the paving contracts which the city gave to McGovern in 1908 and 1909 the Merriam Commission deals with the 1-cent bid made by McGovern and declares he was paid $413,247.64 for work which should have been done for $266,064.54..

The acceptance of this unbalanced bid, and the extension of the contract to about eight times the quantity of work named in the original schedule resulted in the loss to the city of a large sum of money. The contractor was paid $413,247, while, if the proposal of the Western Construction and Maintenance Company, which was the next lowest to the McGovern bid, had been accepted, the amount paid for the same work would have been only $266,064. In other words, the city would have saved $147,183 on the contract.

Comparison of cost of the work done under the McGovern contract with what it would have been at the prices of other bidders shows:

Item.	Amount.	Contract Prices. Unit.	Contract Prices. Total.	Other Bidders. Unit.	Other Bidders. Total.
Repairs, class A, square yards...	229,891	$1.75	$402,309.25	$1.04	$239,006.64
Repairs, class B, square yards...	12,064	.01	120.64	1.40	16,889.60
Cement concrete, cubic yards....	643	3.25	2,089.75	5.00	3,215.00
Binder delivered, tons.....	2,182	4.00	8,728.00	3.15	6,873.30
Total			$413,247.64		$266,064.54

The report in explaining the 1-cent bid points out that work referred to as "Class A" consisted of resurfacing, while work referred to as "Class B" consisted of putting in concrete and binder as well as resurfacing. McGovern bid $1.75 a square yard on the ordinary resurfacing work and bid 1 cent a square yard for putting in concrete and binder and doing the resurfacing.

Wood Block Pavement Favored in Berlin.

For automobile traffic in cities, pavements made of impregnated wooden blocks are said to be the best, according to a report to the bureau of manufactures by A. M. Thackera, American consul general at Berlin. He says they do not wear out automobile tires so quickly, are freer from dust and more susceptible to the influence of dust-binding and dust-settling agents.

Asphalt, however, he adds, is still considered the best all-round pavement for heavy traffic. Experiments in tarring roads to keep down dust, he reports, are being made in various parts of Germany.

Town Planning in England.

The subject of beautifying sections of cities and cities and towns as wholes seems to be even more popular in England than in this country, and the Department of Civic Design of the School of Architecture at the University of Liverpool issues a quarterly *Town Planning Review*, which is a handsomely printed and illustrated magazine of value to everyone interested in this work. It costs only $2.50 a year and the two numbers already received are evidence of the ability and public spirit of the editors and publishers.

National Highways Planned.

At the closing session of the National Good Roads Congress, held in Niagara Falls, N. Y., Representative Sulzer's suggestion for the construction by the State and separate counties of the State of a highway connecting Buffalo, Niagara Falls and New York City, was enthusiastically adopted. The resolutions adopted call for the construction of permanent highways from the national capital to

each state capital, the expense to be borne by money loaned to the states, as set forth in the Sulzer bill, which will be reintroduced in Congress at the next session.

Another resolution adopted called on all organizations, trade, educational, industrial, farmers, producers and consumers, to instruct their legislators to introduce bills for and to fight for better roads throughout the country.

Milwaukee's Municipal Reference Library.

The city of Milwaukee has created a department known as the Municipal Reference Library. The aim and purpose of this department is to make a thorough investigation of all municipal problems now pending, or as they may arise; to anticipate future legislation; to collect, compile, classify and index the charters, laws, ordinances, etc., of cities; to gather data, reports and statistics obtainable from such cities; to collect facts from magazines, newspapers and reports of organizations working along the lines of municipal reform and civic betterment.

This department intends to co-operate with other cities along the lines above mentioned; soliciting the interchange of municipal reports, charters and ordinances and offering, without charge, similar reports, etc., relative to the city of Milwaukee.

MUNICIPAL AND TECHNICAL LITERATURE

Ptitsburg Transportation Problem—Municipal Reports—Books for Engineers

Preliminary Report on Pittsburg Transportation.

Mr. Bion J. Arnold, consulting engineer, has made a preliminary report to the city of Pittsburg relative to the solution of the transportation problem in that city. The question of a subway as a means of meeting the difficulty is discussed in this report and certain lines of inquiry are mapped out with a view to determining the possibility of that solution.

In connection with his report Mr. Arnold offers some suggestions regarding the better routing of the surface cars to insure a more efficient service. At present he says the entire routing system is out of balance. A more complete record system for schedules, delay and accident reports is strongly urged; and a fixed fund for the improvement of service conditions is recommended. These points are most strongly advocated as a means towards relieving the traffic congestion in the downtown district.

Municipal Reports.

Joint Outlet Sewer for eleven separate municipalities in Essex and Union counties, New Jersey. A history and description of an accomplishment by voluntary joint effort. Edition of 1910. By Alexander Potter, C. E., New York City.

This report embodies all the matter that appeared in the edition of 1905, and contains considerable new matter. Among this new matter is a synopsis of the joint sewer laws, under which the joint trunk sewer was constructed and is being maintained. This was written by Mr. Adrian Riker, counsel for the joint meeting since its inception. It is of interest to note that the Passaic Valley Trunk Sewer Commission, which has been commanding a great deal of attention during the last few years, has formulated its laws after the laws governing the joint trunk sewer. This is interesting because agitation for the Passaic Valley sewer was started a number of years before the joint trunk sewer was even thought of, and the fact that the sewer which forms the subject of this report has been in successful operation for the last five years, is a tribute to the wisdom and zeal of those public-spirited men who gave their time and attention to the consummation of this important enterprise.

Another important matter dealt with in this report is that of sewer leakage, the experience of five years of maintenance clearly indicating that in a reasonably well constructed sewer the element of leakage is a progressively diminishing factor. Continuous gaugings of the flow in the sewer at numerous points give abundant testimony as to the truth of the assertion.

Another matter dealt with in the report is a discussion in connection with odors arising from sewers where house traps have been inserted between the sewer and the house vents throughout districts where it has been necessary to close up the perforations in the manhole covers.

The report contains full information as to costs and apportionments of cost. It is also fully illustrated with details of construction and photographs showing the progress of the work, and also contains a map of the district sewered, upon which are delineated the system of main trunk sewers and the laterals connected therewith.

The plan of apportioning the cost of the sewer was suggested by Mr. Alexander Potter and was based upon the capacity which it was assumed each municipality required, and the length of sewer necessary to serve each of the municipalities; or, in other words, the apportionment of cost was based upon the assumption of each town designing its own sewer outlet to a common point and each municipality sharing the cost of such joint sewers as could be used by it in the ratio of their respective capacities in the portions utilized by them. The maintenance, on the other hand, has been apportioned equally between all users, on the basis that, being a gravity system, the town contributing the largest volume to the sewer required no greater service than the town contributing a lesser amount. The experience of the last five years indicates that the flow from the larger towns requires less attention and maintenance than the flow from the smaller towns.

The men most active in bringing this project to a successful completion were Mr. Francis Speir, Jr., Adrian Riker and Alexander Potter, C. E., and it is interesting to note that these three have retained their connection with the joint trunk sewer from its inception to the present time in the respective capacities of chairman of the joint meeting, counsel, and chief engineer.

The towns and cities served by the joint trunk sewer are: Elizabeth, Roselle Park, Irvington, Vailsburgh, a small part of Newark, South Orange, West Orange, Millburn, Summit, and the townships of South Orange and Union.

Books for Engineers.

Bricklaying System. By Frank B. Gilbreth, M. Am. Soc. C. E. 321 pp. Cloth, $3. The Myron C. Clark Publishing Co., Chicago, Ill.

This book is the first attempt to put modern brick laying methods in form for general use, and as the author is an eminently successful engineering contractor who is a skilled observer and organizer, he has prepared a most useful and practical book. It bears the marks of being largely a compilation of instructions to men engaged upon work under the author's care, which have thus been thoroughly tested in practice.

The object of the book is stated to be the recording of the traditional methods of bricklaying, the formulation of labor and cost saving methods of doing the work which at the same time increases the pay of first-class workmen, so that the apprentice may begin his work intelligently and become proficient in as short a time as possible. The book will also be of great value to the foreman, the superintendent, the contractor, the architect and the engineer, even more than to the apprentice.

The titles to the chapters show the scope of the work. The first on "Training Apprentices" is largely a series of brief instructions to the learner. That on "Methods of Management" is largely addressed to the foreman. That on "Methods of Construction" appeals to the superintendent, as do those on "Routing of Materials," "Scaffolds," "Gilbreth Scaffold, Hod Type," "Gilbreth Scaffold, Packet Type," and "The Gilbreth Packet System." "Tall Chimneys," "Mortar," "Bricks," are for contractor, superintendent and foreman. "Bricklayers' Tools" comes back to the apprentice and shows how to use the common and the modern tools. So do the chapters on "Lines, Plumbs and Poles," "Motion Study," "Methods of Laying Brick Under Special Conditions," "Finishing, Jointing and Pointing," "Arches and Chimney Breasts," "Tearing Down, Cutting Out and Patching Brickwork," from which the expert bricklayer can also derive much benefit. The chapter on "Bond" and the seventy-three bond charts are also of great value to the architect and engineer. The book ends with a glossary of the terms used.

The author gives some valuable advice to brick masons regarding the improvement of quality and reduction in price of brickwork, without reducing the pay of the workmen, by using modern methods and management, so that brick work will not be crowded out of the field by the cheaper and often more flexible modern material, concrete, plain or reinforced. The attitude of many brick masons' unions toward concrete is deplored and if they will follow the author's advice it will result in benefit to both the brick and the concrete trades.

Sanitary Engineering, a practical treatise on the collection, removal and final disposal of sewage and house refuse and the design and construction of works of drainage and sewerage, with numerous hydraulic tables, formulae and memoranda, including an extensive series of tables of velocity and discharge of pipes and sewers. By Col. E. C. S. Moore, R. E. Third edition revised and in part re-written by E. J. Silcock, M. Inst. C. E. In two volumes. Vol. I, Sewerage, Hydraulics, Sewer and Drain Ventilation, Sanitary Fittings and Apparatus, pp. 1-500. Vol. II; Land Drainage, Sanitary Notes, Sewage Disposal, Refuse Destructors, Trade Effluents and Sewage Fungus, pp. 501-880. With 920 illustrations, 91 large folding plates. Cloth. $14 net. J. B. Lippincott Company. Philadelphia, Pa.

This book, then in one volume, was carefully reviewed some seven years ago in MUNICIPAL ENGINEERING. The third edition has been materially improved and

brought down to date, particularly in the sections devoted to sewage disposal and refuse destruction, in which fields there has been much advancement made in the past ten years. The book is a report of English practice, under English conditions, but is for the American nevertheless the best book on the subject of sanitary engineering which there is on the market. It fully takes the place for modern practice of the classic Latham, so long the standard.

Owing to the death of Col. Moore, the new edition is revised by E. J. Silcock, the president of the Society of Engineers, who has followed the same lines of treatment and has largely re-written the second volume, on sewage and refuse disposal.

In the first volume there have been numerous additions of new material, including odorless excavators, fuller discussions of the various systems of sewerage, of rainfall and methods of carrying it off, sewage lifting with examples of installations, concrete, plain and reinforced, in

In the first volume there have been numerous additions of new material, including odorless excavators, fuller discussions of the various system of sewerage, of rainfall and methods of carrying it off, sewage lifting and examples of installations, concrete, plain and reinforced in sewer construction, sewer joints and appurtenances, what is styled the new egg-shaped sewer form, with tables of capacities, the triangular notch sewer ventilation, and triangular notch sewer, ventilation, and

The second volume gives descriptions of the best installations of all the various reasonably successful methods of purifying sewage, destroying refuse and disinfecting materials and habitations and is nearly all either new or newly arranged and brought down to date, so that this volume contains the best that can be found on these subjects so far as English practice is concerned. This list of new materials in the books covers all the sanitary engineering construction and design in which notable advances have been made, and is evidence that the book gives equally good treatment of the standardized practice in this field, which is corroborated by the earlier review above referred to. Every American as well as English sanitary engineer should have this third edition, whether he has the earlier editions or not.

How to Use Concrete. A book of practical information not found elsewhere about the uses of concrete. Written in plain English for the practical man. Compiled by Walter C. Boynton and R. Marshall. Cloth, 233 pp., $1. Concrete Publishing Co., Detroit, Mich.

The editor of this book has not seen the contradiction on the title page between the statements that the book is a compilation and that the information is not found elsewhere. Like many books written in plain English for practical men, this book omits many important details in processes. Whether this is due to the strong tendency of the practical man to omit the things which he is so accustomed to that they do not impress him as essentials, or whether it is due to the attempt of the office man with no factory experience to devise methods for the mechanic to follow, will be easily seen by the reader.

Warning is given that artistic results can not be obtained without artistic training, but the warning is discounted by reference to occasional good results from beginners in such work.

The book is certainly a compilation and from many sources, good and indifferent and positively bad so far as the ornamental features are concerned. Haste in compilation is shown by the mass of unrelated statements under the division beginning on page 163 under the heading "Portland Cement Production," which contains data and statements concerning all phases of cement and concrete materials and uses, apparently taken from a superficially edited question department without taking the trouble to check one statement by another and with no attempt to classify the data given.

It is such books as this which lead to the failures in strength of concrete structures and to the crude and positively ugly attempts at ornamental work in cement and concrete, which delay the progress in the general public opinion which concrete demonstrates that it deserves when used by technical and artistic experts.

Bruecken in Eisenbeton; ein Leitfaden fuer Schule und Praxis. Second part, arches. By C. Kersten. Paper, 198 pp., 5.20 marks; cloth, 6 marks. Wilhelm Ernst & Sohn, Berlin, Germany.

The first chapter takes up many details peculiar to reinforced concrete in bridges, showing approved forms. The subsequent chapters classify the details and methods of construction under single-span arches, solid and ribbed, with rods and bars, with trussed reinforcement, with and without hinges, trussed concrete arches, subways and conduits, and arched roofs. There is also a well-illustrated chapter on centers for concrete arch construction. The book is conveniently arranged and unusually full of detail for so brief a treatment of a large subject and should be very satisfactory for those who can read German.

The Everyday Uses of Portland Cement. Boards, 156 pp. The Associated Portland Cement Manufacturers (1900) Ltd., Portland House, London, E. C., England.

This book, which is distributed in England without charge to those interested in the use of cement, is intended to furnish the "lay user of Portland cement, i. e., the farmer, estate owner, manufacturer and householder," with some account of the many uses to which they can put cement and concrete and some idea of how the materials are handled in making the constructions described. It is written in simple language, "plain English for the prac-

tical man," but it is written by experts in the handling of cement and concrete, who have done their work carefully and with an absorbing interest in their work.

The material in the book is well selected and well arranged and the reader, when he has read the interesting connected story, will feel that he knows something about the subject, at the same time that he will believe that the actual manipulation should be intrusted to practical hands. The book is well illustrated, printed on good paper and neatly bound.

While the publishers may not be willing to distribute the book free outside their own field, it can perhaps be obtained by paying the cost of production and delivery, possibly 50 to 75 cents.

The Engineering Index Annual for 1909. Twenty-sixth year. Cloth, 471 pp., $2. The Engineering Magazine, New York.

This is the fourth of the annual volumes, the previous years being included in four preceding volumes, and is compiled in the same form as those of the last three years. The civil engineering field is not covered very satisfactorily, and occupies only 95 pages. Electrical engineering covers still less, 63 pages; industrial economy has 16 pages, marine and naval engineering 23 pages, while mechanical engineering has 132 pages, mining and metallurgy 86 pages, and railway engineering and street and electric railways together have 56 pages.

The method of classification is not always happy and it is necessary to look in several places for all the information on a subject. Thus articles on explosives are listed on pp. 178, 335 and 393, under Marine and Naval Engineering, Mining and Metallurgy, and Mining. Explosions has still other locations. This arises from the fact that the subject of explosives is important in each of these divisions, although it would seem that the two under mining classifications might be united into one. There should be some way for one who is looking up the general subject of explosives to find all the headings without looking through all the general divisions of the index. There are many other headings of the same sort.

The gathering of monthly indexes into an annual volume is a convenience.

Die Grundzuege des Modernen Krankenhausbaues. By Max Setz, Architect. Cloth, 204 pp., 120 cuts and several tables, 3.80 marks. Druckerei- und Verlags-Aktiengesellschaft vorm. R. v. Waldheim, Jos. Eberle & Co., Vienna, Austria-Hungary.

This little book gives an excellent general view of the principles of design of hospitals for various purposes and is well illustrated with many plans of buildings, photographs of rooms, drawings of apparatus and details, etc. It seems to cover all the modern improvements of every sort and should be exceedingly interesting to those in whose field it belongs.

Municipal Franchises. A description of the terms and conditions upon which private corporations enjoy special privileges in the streets of American cities. By Delos F. Wilcox, Ph. D., Chief of the Bureau of Franchises of the Public Service Commission for the First District of New York. In two volumes, of which the first is now published. Cloth, 710 pp., $5. The Gervaise Press, Rochester, N. Y. Engineering News Book Co., New York, distributing sales agents.

The author is in position to become thoroughly familiar with franchise questions and this first volume of his book demonstrates that he has taken full advantage of his opportunities and that he is more than willing to share the results of his most intelligent labor with his fellow citizens.

The complete book will include four parts, two of which are contained in this first volume. Part I is introductory and discusses in judicial language "How Franchises Get Away," "What a Franchise Signifies," "Monopoly Profits and Ways of Limiting Them," "Injuries to Individuals and Ways of Preventing Them," "Temptations to Public Wrong and Ways of Overcoming Them." The second part gives in sufficient detail and in good English, shorn of confusing legal terminology, the provisions of many franchises in cities of various sizes providing for the operation of systems of public service using pipes and wires. The third part will give a similar analysis and discussion of transportation franchises of all kinds, and the fourth part will discuss the taxation and control of municipal franchises, and will, apparently, express the author's opinion more fully than is possible in those parts devoted to the statement of what has already been done in the formulation of franchises.

Part II includes electric light, heat and power, telephone, telegraph, messenger and signal services, conduits, water works, sewers, central heating and refrigeration, pneumatic tubes, oil pipe lines, artificial and natural gas. Examples of franchises are taken from many cities, such as Birmingham, Los Angeles, San Francisco, Denver, New Britain, New Haven, Washington, Atlanta, Boise, Rockford, Chicago, Springfield, Indianapolis, South Bend, Des Moines, Cedar Rapids, Topeka, Wichita, Newport, New Orleans, Baltimore, Boston, Worcester, Springfield, Somerville, Saginaw, Grand Rapids, Ann Arbor, Detroit, Kalamazoo, Duluth, Minneapolis, St. Paul, St. Louis, Kansas City, Butte, Jersey City, Newark, Trenton, Long Branch, Atlantic City, Buffalo, New York, Troy, Rochester, Syracuse, Lockport, Cleveland, Cincinnati, Columbus, Toledo, Portland, Philadelphia, Erie, Harrisburg, Lancaster, Johnstown, Nashville, Knoxville, Austin, Salt Lake City, Richmond, Seattle, Wheeling, Milwaukee, La Crosse.

The present volume gives many pointers on how not to build a franchise, but many more on the details which it is advisable to include in a franchise, so that one who

studies the book carefully will be able to cover all the points which any one has found worth formulating under the conditions which have existed heretofore.

The author has had and will have excellent opportunity by virtue of his official connections to improve the conditions of cities, especially in his own State, as regards the terms of franchises for municipal public service industries, and it is to be expected that he will consider in full detail in his fourth part numerous features which have been proposed and many of which have been adopted and give promise of bettering the conditions on both sides, by letting in the light. Many of these problems have been quite thoroughly discussed in MUNICIPAL ENGINEERING from time to time. Naturally only a few phases of the problems are considered from the new standpoints of equity and publicity in the introductory chapters of the present volume, and his treatment of others in the next volume is awaited with interest in view of the excellent work the author has done thus far.

ORGANIZATIONS AND INDIVIDUALS

League of American Municipalities—Technical Schools—Technical Organizations—Civil Service Examinations—Henry Mueller—Personal Notes

The League of American Municipalities.

The fourteenth annual convention of the League of American Municipalities was held in St. Paul, August 23 to 26. MUNICIPAL ENGINEERING goes to press too early to receive a full report of the meeting, but the following account of the earlier days, by an editorial correspondent, covers most of the points of interest to our readers.

President Heineman called the convention to order at 10 a. m., August 23, in the St. Paul auditorium. Hon. H. P. Keller, mayor of St. Paul, delivered the address of welcome, and in his remarks he called attention to the need of better city government. In the response to this address President Heineman remarked upon the business ability required in city affairs and upon the fact that the league was an aid to the betterment of business conditions. President Heineman also paid tribute to the memory of Governor Johnson, of Minnesota. Attention was called to the development of tubercular hospitals and the need of a unified movement in that direction. The president also urged the adoption of measures leading to the establishment of a central library for the collection and exchange of city documents.

A letter was read from President W. H. Taft, declining the invitation to attend the convention and conveying his approval and best wishes for the league and its work. The treasurer's report was then read, and a paper by Dr. P. M. Hall, commissioner of health of Minneapolis, completed the morning's business.

In Dr. Hall's paper the matter of garbage collection and disposal was treated, taking for an example the city of Minneapolis. In this system the garbage is divided into two classes and a can is provided for each class. The division is into combustible material, such as kitchen garbage, refuse, etc., and incombustible material, as ashes, glass and tin cans. According to the rules of the Health Department, all moisture must be drained from the material of the first class and it must be carefully drained and wrapped in paper before being placed in the can. This does away with the frozen garbage can in winter or the "foul, maggoty mess" in the summer; in addition to prolonging the life of the can. Under this system collection once a week is often enough to avoid nuisance, and the drivers of garbage wagons have orders to pass by and report all cans which do not meet the Health Board requirements. The system has been successful, for where formerly about thirty complaints per day were turned in regarding unsanitary garbage cans, a complaint is now a rarity. In conclusion, Dr. Hall called attention to their garbage incinerator, which, in burning the garbage, furnishes heat, light and power for the city workhouse, the superintendent's house, two greenhouses and the Hopewell Tubercular Hospital. The fact that the latter institution was located near the crematory, three years after the crematory had been constructed, is a tribute to the absence of all nuisance about the garbage handling and incineration.

In the remarks following Dr. Hall's paper the mayor of Baltimore told of that city's plant, where the garbage is hauled fourteen miles, the grease and ash

are utilized and where the garbage is sorted before incineration. Mayor Behrman, of New Orleans, in commenting on Dr. Hall's paper, called attention to New Orleans' garbage disposal. It was formerly the custom to haul all garbage to receiving stations on the Mississippi, where it was dumped into barges and hauled out to sea. At present all garbage is dumped into swamps lying about New Orleans, with the double purpose of filling the swamps and killing the mosquitoes. The mayor of East St. Louis asked why Dr. Hall did not give some costs of disposal. In reply Dr. Hall stated that costs were a matter of local conditions, and that they should, under any condition, be subservient to sanitary considerations.

At the opening of the afternoon session of the league, Mr. A. H. Griffith, director of the Detroit Museum of Art, read a paper recommending that more attention be paid by municipalities to art and its advancement.

After this paper was read a resolution was unanimously adopted condemning the attempted assassination of Mayor Gaynor, of New York, and expressing the sympathy and good wishes of the convention.

Mayor Behrman, of New Orleans, then read a paper on "The Street Paving Problem." He commented on New Orleans' slowness with regard to her paved streets and offered in explanation the fact that New Orleans first had to solve the levee problem for self-protection, and the sewage and water problem for sanitation, before even considering the paving problem. Asphalt is the most popular paving material and brick the least popular in New Orleans. Provision is made in each contract for the maintenance of all repairs for a period of years. The city retains 15 cents per square yard of the contract price of the pavement as a sort of insurance of the fulfillment of the contract. The city owns its own asphalt repair plant and takes care of all its asphalt pavements, repairs being made in all cases before a break in the surface appears. Mr. Behrman's paper contains some valuable statistics, and will be published soon.

Mr. Frank T. Fowler was absent, and his paper on "Street Paving from a Maintenance Standpoint" was not read.

Mr. E. C. Schreiter, clerk of the common council of Detroit, next read a paper dealing with Detroit's paving affairs. The state law permits Detroit to do $500,000 worth of forced paving per year, without the consent of the property owners. The property owners pay all costs of paving except subdrainage and intersections, assessment being made on the front foot basis. All repairs, intersections and repaving are paid from the general fund. The city owns her own asphalt resurfacing plant and does resurfacing at a cost of from 86 to 98 cents. This plant has a capacity of 1,800 square yards, and was built at an original cost of $55,600. All contract work is paid for by bills issued by the city engineer's office. These bills, upon recording, constitute a prior claim on any piece of property, and property may not be sold until it is shown that paving assessments, etc., have been discharged.

Following Mr. Schreiter's paper, the convention adjourned to enjoy a sightseeing automobile trip over the excellent paved streets and oiled roads of St. Paul.

At the Thursday morning session the auditing committee reported the treasurer's books in good order; the report was accepted.

Mr. Blair, secretary of the National Paving Brick Manufacturers' Association, read a paper on the proper construction of brick pavements. In his paper Mr. Blair endeavored to meet the seeming lack of interest in brick pavements in some sections. He brought out the fact that poor brick pavements are not entirely due to the quality of brick used; in fact, the manner of laying influences the durability and practicability of brick streets. Mr. Blair said that when brick streets were properly constructed they were beautiful, smooth, sanitary, gave a minimum amount of noise, and possessed a low tractive resistance. The points he set forth in the proper construction of brick streets were: First, have the sub-grade carefully prepared, drained and brought to the required grade; second, place the concrete foundation on this sub-grade, taking care to bring it to smooth surface; third, spread upon this smooth surface a sand cushion of never less than 2 inches of fine sand; fourth, place the brick with the best surface uppermost and roll with a roller not exceeding five tons in weight (never a horse roller); fifth, use a good cement filler, with expansion joints allowed along the curb. Mr. Blair dwelt at some length on the latter point, stating that no soft filler would insure the bricks against cracking and chipping.

In the discussion following Mr. Blair's paper several interesting points were brought out. It was stated that the size of the brick made no difference in the pavement, beyond the fact that a brick larger in its least dimension than 3½ or 4 inches was seldom well burned. In reply to a complaint from a Moline delegate, stating that their pavements were noisy, having raised from the foundation by reason of expansion, Mr. Blair replied that if careful side expansion joints were allowed and competent men were employed to see that the joints were made after the filler was applied and were properly filled with the right material, this trouble would not occur. A No. 6 pitch was recommended for the more northern regions like St. Paul and Minneapolis, while for regions farther south a good asphaltic filler was advised to fill the expansion joints. In reply to a question, Mr. Blair characterized Kansas City's brick streets as "bum," due to lack of care in laying, and not due to the brick. It was stated that square or round cor-

nered bricks are equally good, and that the round corners did not cause little fins of the cement filler, which cracked off. As a proof of this, Mr. Blair stated that on the Indianapolis Speedway these little projections of cement tended to wear out the automobile tires. In order to remove them they tried drags of stone and other materials, wearing out the drags, but leaving the projections. It was finally necessary to use a corundum drag to smooth them down. Only a slight crown was advised, and any system of laying consistent with beauty was recommended, the laying having no effect on the wearing quality.

Following Mr. Blair's paper, Mr. F. R. McDonald, superintendent of Minneapolis city workhouse, read a very interesting and instructive paper on the psychological side of city reformatory work as typified in the workhouse. Mr. McDonald dwelt at length on the advisability of furnishing out-of-door employment either on farms, brickyards, stone quarries or gravel pits, for the most efficient means of correcting the criminal tendencies of the short-term prisoners.

An address by Hon. John H. Gundlach, president of the council, of St. Louis, Mo., on the city's control of outlying districts, concluded the official program for the day.

The delegates were entertained during the afternoon by the Associated Playgrounds of the city.

On Wednesday the convention was the guest of Minneapolis, and visited the parks, public buildings, city workhouse and crematory. At the late afternoon session, held in Music Pavilion Hall, the government of cities by commission was discussed. This will be considered later.

The Friday program included discussions of "Home Rule for Cities," by J. Barry Mahool, mayor of Baltimore, James C. Dahlman, mayor of Omaha, Neb., and Thos. Maloney, mayor of Council Bluffs, Ia.; "Simplified City Government," by S. A. Carlson, mayor of Jamestown, N. Y.; "The Relation of the Municipality to Its Public Service Companies," by J. C. Haynes, mayor of Minneapolis, and a general discussion of what cities are doing and in what they excel.

A municipal parade was witnessed at 3:30.

Officers elected are D. A. Brown, pres., Kansas City, Mo.; R. A. Maddox, Atlanta, Ga., and T. E. Knotts, Gary, Ind., vice presidents; John MacVicar, secretary-treasurer, Des Moines, Iowa. The next meeting will be held in Atlanta.

Technical Organizations.

The annual meeting of the American Public Health Association will be held in Milwaukee, Wis., September 5, 6, 7, 8 and 9. W. C. Woodward, secretary, Washington, D. C.

The annual meeting of the Association of Edison Illuminating Companies will be held at Thousand Islands, N. Y., September 6, 7 and 8. Walter Neumuller, assistant secretary, 55 Duane street, New York City.

The annual convention of the International Association of Municipal Electricians will be held at Rochester, N. Y., September 6, 7, 8 and 9. Frank P. Foster, secretary, Corning, N. Y.

The annual meeting of the Michigan Gas Association will be held on board steamer sailing from Detroit, Mich., September 8, 9, 10, 11 and 12. Glenn R. Chamberlain, Grand Rapids Gas Light Co., secretary, Grand Rapids, Mich.

The annual convention of the Colorado Electric Light, Power and Railway Association will be held at Colorado Springs, Colo., September 21, 22 and 23. J. C. Lawler, secretary, P. O. Box 938, Colorado Springs.

The annual convention of the New England Water Works Association will be held at Rochester, N. Y., September 21, 22 and 23. Willard Kent, secretary, Narragansett Pier, L. I. The papers include six or seven descriptive of Rochester and its water works, "Steel Pipe Lines," "Ice Formation," "Statistics of Growth of Income," "Depreciation," "Transportation of Sand and Water in Pipes and Hose Lines," "Flies and Disease," "Corrosion of Metals."

The annual meeting of the National Irrigation Congress will be held at Pueblo, Colo., September 26, 27, 28, 29 and 30. Arthur Hooker, secretary, Pueblo.

The annual convention of the American Society of Municipal Improvements will be held at Erie, Pa., October 11, 12, 13 and 14. A. P. Folwell, secretary, 239 West Thirty-ninth street, New York City.

The seventh annual convention of the National Association of Cement Users will be held December 12 to 23, 1910, in the Concert Hall of the Madison Square Garden, New York City. The seventh annual exhibition of the association will be held combined with the first annual Cement Show of New York, under the auspices of the Cement Products Exhibition Co., of Chicago, Ill.

The annual summer meeting of the Connecticut Society of Civil Engineers was held at Scotland and New London, Conn., August 16. The members and their guests visited the dam and power station of the Uncas Power Co., at Scotland, and then took a special electric car for New London, passing through the towns of Windham and Norwich. After dinner, which was served at Ocean Beach, near New London, a short business meeting was held.

The annual convention of the American Association of Park Superintendents was held at Harrisburg, Pa., August 9 and 10. A special trip to Gettysburg was made August 11. Among the subjects treated in papers and addresses were the following: "The Latest Conclusions About Road Surfaces," W. H. Dunn, superintendent of

parks, Kansas City, Mo.; "Various Methods of Treating Roads in Omaha," W. R. Adams, Omaha, Neb.; "Reasons for Parks," J. Horace McFarland.

The Ohio Valley Exposition will be held in Cincinnati August 29 to September 24 to exploit the industries and resources of the Ohio Valley and the South and to celebrate the completion of the Fernbank dam, one of the permanent Ohio river improvements, as well as the centenary of steam navigation on the Ohio.

The fourth international conference on state and local taxation is held at Milwaukee under the auspices of the International Tax Association on August 30 to September 2.

The American Society of Engineering Contractors, of which Mr. D. E. Baxter, of 27 William street, New York City, is president, and D. J. Hauer, secretary, will hold their annual convention in St. Louis September 27, 28 and 29, in the Coliseum. The local committee on arrangements is E. H. Abadie, chairman, J. L. Westlake, W. C. Swartout and L. C. F. Metzger. Papers will be delivered by J. B. Goldsborough and Ed. Wegmann, both of New York, on "Dam Construction for City Water Supplies," and by George C. Warren of Boston on "Work Preliminary to Street Paving and Road Work." A banquet will be held and several sight-seeing trips will be made to important engineering work in and around St. Louis. The society now has 800 members.

The Cement Products Association promises two great shows this year, the first in Madison Square Garden, New York City, December 14 to 20, 1910, and the second in the Coliseum at Chicago, February 17 to 23, 1911. The successes of the past will doubtless be duplicated at both exhibitions, and those interested in any way in the use of cement can not afford to miss these shows.

The directors of the New York Bureau of Municipal Research are to conduct a correspondence school in municipal accounting and reporting, using $10,000 a year for three years, contributed by Herman A. Metz, former controller of New York City, as the guarantee fund.

The International Exhibition of Railways and Land Transport is now in full swing in Buenos Aires, Argentine Republic, and will be open until November 30.

The Pittsburg Civic Commission has published a report by B. J. Arnold, John R. Freeman and F. L. Olmsted on the purpose and progress of city planning in Pittsburg, discussing such subjects as steam and electric railroads, water transportation, floods, street systems, water supply, sewerage, public and private lands and buildings and control of them, and smoke abatement.

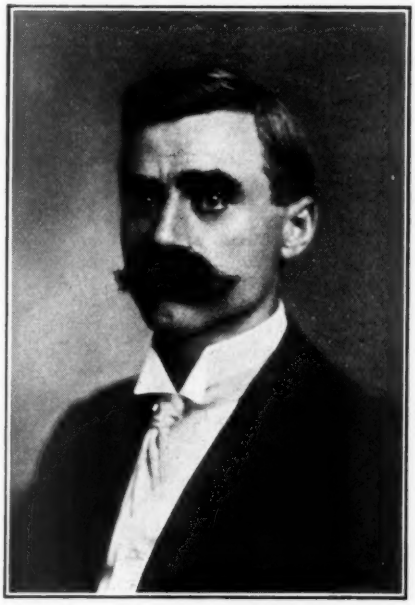
The Metropolitan Sewerage Commission of New York has published a report strongly opposing the proposed discharge of sewage into the Hudson river from the Bronx Valley sewer.

Arrangements are being made in Pittsburg for a mammoth land show, which is to be held October 17 to 29. The object of the exposition is to provide information to the farmer, the homeseeker and investor regarding land openings and developments in all sections of the country, and to show samples of the mineral, agricultural, horticultural and botanical products of the soil, and to teach the students and laymen educational facts concerning land reclamation and irrigation. The exhibits will include those of the United States Government, boards of trade, chambers of commerce, commercial bodies, land and irrigation companies and State exhibits from all parts.

The Oklahoma Cement Users and Contractors will meet at Oklahoma City, October 6, 7 and 8. The cement show will be held during the whole of the State Fair, September 27 to October 9.

Henry Mueller.

One of the most progressive firms in plumbing manufacturing is the Mueller



HENRY MUELLER.

Manufacturing Co., of Decatur, Ill. It was founded by H. Mueller, Sr., who died some ten years since, and has been continued by his five sons, the oldest of whom was Henry Mueller. The mechanical genius of the father was inherited by the son and the latter has probably done more than any other one man to standardize plumbing specialties and to improve their design and construction as well as to invent and design new additions to the trade, which have vastly improved conditions. The plumbing trade

has been practically revolutionized within Mr. Mueller's lifetime and his firm has done its full share in bringing about the improvement.

Mr. Mueller was stricken with apoplexy on August 13, dying within a few hours. The tributes to his memory by citizens of Decatur, by many of the seven hundred employes of whom he was the mechanical director, demonstrated his standing and the high opinion held by all concerning the quality of his life and work. The four brothers and a brother-in-law continue the business under the same name with the necessary changes in organization to fill the vacant space.

Technical Schools.

The Michigan College of Mines, Houghton, Mich., has issued its year book for the past year, with announcement of courses for 1910-11, also a list of graduates and a booklet of views of the college and its activities.

Civil Service Examinations.

The U. S. Civil Service Commission will hold examinations at the usual places as follows:

Sept. 7-8: Computer in Coast and Geodetic Survey at $1,200 a year.

Sept. 14-15: Civil engineers and superintendents of construction in Quartermaster's Department at Large at San Francisco, Cal., Ft. Bayard, N. M., and Washington, D. C., at $1,500 a year each.

Oct. 5: Building inspector in Quartermaster's Department at Large, Ft. Crockett, Tex., at $900 a year.

Personal Notes.

Dr. A. G. Horine has been re-elected mayor at Brunswick, Md.

F. P. Kurtz has resigned as city engineer of Cottage Grove, Ore.

John Harvey of Hamilton, Ont., has been elected city engineer of Oxford, O.

B. W. Doremus has been elected chief of the fire department at Roselle Park, N. J.

John H. Marley of Baltimore, Md., has been appointed inspector of gas meters by the Utilities Commission.

E. M. Crooken has been appointed engineer and superintendent of the park district at East St. Louis, Ill.

G. H. Bryson has resigned as city engineer of Victoria, Wash., and has been succeeded by August Smith.

J. Edward Simmons, former president of the board of water supply of New York City, died August 5 at Lake Mohonk, N. Y.

C. E. Grunsky, former city engineer of San Francisco, Cal., but who has been located in New York City for several years doing work for the United States, has returned to San Francisco and will resume the practice of civil engineering at 2714 Steiner street.

The Roebling Construction Co. have removed their New York offices to the thirty-second floor of the Metropolitan Tower.

Charles A. Muller, of the Muller Gravel Heater Co., Milwaukee, Wis., has been appointed deputy highway commissioner of Milwaukee.

C. F. Kelly has been elected mayor of El Paso, Texas, to succeed Mayor W. F. Robinson, who was recently killed by a falling wall in a fire.

Charles A. Hammond, M. Am. Soc. C. E., former resident engineer of the sewage disposal works at Mt. Vernon, N. Y., has been made manager of the works.

H. H. Davenport has been appointed district superintendent of roads for Windham county, Connecticut, by the Connecticut State Highway Commission district.

Wm. H. Merrill of the Underwriters' Laboratories at Chicago, has published a paper giving a full statement of the objects of the tests and investigations undertaken by the institution.

Frederick H. Lewis, M. Am. Soc. C. E., has resigned as general manager of the Standard Portland Cement Co., Leeds, Ala., to spend several months in travel, but will continue to serve as vice-president and director of the company.

Charles Mulford Robinson, Rochester, N. Y., has made a study of the possibilities of beautifying the city of Waterloo, Iowa, and his report has been published in a handsomely illustrated booklet by the Civic Society of Waterloo.

Charles Whitney Baker, editor of the *Engineering News*, just after his arrival at Birmingham, England, July 25, to take part in the joint meeting of the American Society of Mechanical Engineers and the Institute of Mechanical Engineers of Great Britain, was taken seriously ill of scarlet fever. His return to New York will be delayed until the last part of September owing to the necessary isolation period.

Hon. W. F. Robinson, mayor of El Paso, Texas, was crushed to death August 14 by the falling walls of a building during a fire. Fireman Todd Ware was killed also at the same time, and firemen William Robinson and assistant fire chief Dave Sullivan badly injured. Mayor Robinson, who had been on the scene for two hours, observed that the walls were swaying with the wind and warned the firemen to leave the building. The walls fell, however, just as the firemen were starting to leave, and, tumbling towards the spot where the mayor stood, crushed him to death.

Mr. J. N. Chester, formerly chief engineer of the American Water Works and Guarantee Company, and Mr. Thomas Fleming, Jr., formerly principal assistant engineer in charge, design and construction section, Pennsylvania State Department of Health, announce the formation of a partnership for consulting engineering, with offices in the Union Bank Building, Pittsburg, Pa. The field to be covered will embrace water works and purification plants, sewerage and sewage disposal, power plants, reinforced concrete construction, appraisements, reports, operation and management of water, power, and sewage disposal plants.

MACHINERY AND TRADE

A New Sewer Cleaning Device.

A demonstration of a new sewer cleaning device was given in Kansas City before the mayor and members of the Board of Public Works. The device was exhibited by Mr. Henry Sieben by whom it was invented.

The machine is a tube, two feet long and about the size of an ordinary fire hose. It is equipped at the rear end for the attachment of a hose. At the other end is a small turbine engine, the revolutions of which propel an outside wheel to which are attached sharp hooks and broad brushes. A windlass is set up at a manhole and at the end of a cable reaching through the sewer the device is attached. It is then drawn throughout the length of the sewer with hose attached and the water running in from the rear turns the engine and the cleaning wheel.

The hooks grind the dirt, the water reduces it to a soft mixture which is easily carried ahead, and the scrubbing of the brushes concludes the cleaning process.

But this is not the finish of the job. A cylinder containing a disinfectant is carried at the rear of the machine and the fluid is sprayed about the inside of the pipes by the action of the water.

The Twentieth Century Grader.

The Baker Manufacturing Company of Chicago has put on the market a grader which is a many purpose machine, for it can serve as a road grader, land leveler, ditch cutter, border thrower, sage brush cutter, snow plow, shallow drain maker, lateral cleaner.

The contractor for road construction will be interested in the machine, for it is just the light grader which is needed for putting the sub-grade in shape. It can turn quickly in half the width of the street and so is specially valuable on streets built in short sections; and the grader can pass rapidly up one side of the street and down the other. Following after the plow it will break up the clods and level and shape to an even crown a hundred linear feet an hour of 24-foot street. On the country roads, which may be opened in longer sections, the grade will shape up about 2000 feet a day, reducing the cost of this work after plowing to one-fourth to one-third cent per square yard.

Stone road contractors will find the grader economical for spreading broken stone, reducing the cost of this operation to 1 or 2 cents a cubic yard. Stone is dumped in consecutive piles 24 inches high, each pile containing 2 cubic yards. The grader then cuts off the top, using the blade straight and makes the layer of stone continuous. For the final spreading the blade is set at an acute angle. One man can drive and handle the levers, and spread in two hours all the stone hauled 1½ miles in 10 hours with 6 teams, is the reported experience of one contractor.

One good point about the grader, suggested above, is the possibility of setting the blade at any desired angle, straight, right or left.

The street departments of towns and cities will find the grader of great value for moving snow. It cleans sidewalks at the rate of 600 to 800 feet of 6-foot walk in five minutes with a light team, and makes them clean. A 7-foot blade is set at the angle to cover a 6-foot walk, or a 6-foot blade for a 5-foot walk. The same machine can be used in other seasons for road grading. In the larger cities the grader is equally valuable for moving snow on the streets. In one hour the grader has moved into a windrow the snow from 7570 square yards of asphalt pavement. It will serve equally well for cleaning gutters or for pushing the snow into windrows in the gutters, according to the requirements. One man and a light team do this work.

There are so many uses for the machine that one article will not cover them all. Those who want the story all at once should send to the Baker Mfg. Co., Chicago, Ill., for a catalog.

Climatological Data.

The U. S. Weather Bureau prepares summaries of the climatological data of sections of the United States which are exceedingly convenient and should be called to the attention of engineers. The summaries for sections 67 and 68, together, covering the State of Indiana, are samples of the results. The precipitation tables give the monthly precipitation for all the years of observation, with monthly and annual means, for all the stations in the section, with elevation of station, grouping the stations according to drainage basins. Mean, maximum and minimum temperatures for each month in the year, with statement of number of years included in averages, are given, dates of first frosts and last frosts, average depth of snow, average number of rainy days.

The relative humidity, wind direction prevailing, average wind velocity, percentage of sunshine, are given for the principal station and for the principal stations in adjoining sections in other states. Monthly discharges of rivers in the section are also given when determined by the U. S. Geological Survey. The precipitation tables are also shown graphically.

Concrete in New England.

The Concrete Bureau, Old South building, Boston, Mass., has issued a directory of cement-concrete designers and constructors of New England which it sells at $2. The names are given in an alphabetical list, giving information about the business followed, and the names are arranged geographically in the fourth list, from which reference must be made to the first list for details. Another list gives names of business and professional men connected with cement-concrete interests, including men connected with the firms listed in the first list, professors in colleges, etc. This list is alphabetical and not geographical. There is also a geographical list of cement structures in New England with brief data concerning them.

The lists are surprisingly short and one who does not live in New England may perhaps be pardoned the inquiry whether that section of the United States is so small that the arrangement of names of men by post-office addresses is of secondary importance and may be safely ignored, as in the second list.

Cameron Septic Tank Patents.

The Cameron Septic Tank Company, 352 Monadnock Block, Chicago, Ill., has sent a letter to each municipality and to others operating sewage disposal plants involving the septic process, giving the present status of litigation on septic process patents, from which the following is abstracted:

Broad claims of patent No. 634,423 have been sustained and decreed valid by the United States Circuit Court of Appeals in the case of Cameron Septic Tank Co. vs. Saratoga Springs, et al. (reported at pages 453-464 of the 159 Federal Reporter).

The contention was then raised that the seventeen years term of the patent, extending to October 3, 1916, would be shortened by the expiration of foreign letters patent, of shorter term, on the same invention. Under an old statute this would have been true, assuming such foreign letters patent to be for the same invention, but the International Treaty of Brussels, which went into effect on September 14, 1902, abrogated the older statutory provision and freed every then existing United States patent from such dependence on any foreign patent. This matter we have now carried to the Supreme Court of the United States, the case now standing on the docket of that court for the October term, 1910. We are entirely confident that the Supreme Court, as the final arbiter of all matters involving the application of an international treaty, will decide this issue in favor of this patent, just as the same issue has recently been decided in favor of another patent in the United States Court of Appeals (Hennebique Co. vs. Myers, reported at pp. 873-874 and 880-891 of 172 Federal Reporter). Such a decision of the Supreme Court of the United States will be conclusive upon all of the other courts of the country, and all parties who have taken the risk of infringing this patent, on the theory that it would so expire, will be without recourse.

The position of the company regarding pressing of suits pending the decision in that referred to and regarding collection of royalties in case the suit is decided favorably to the company is then stated briefly but clearly.

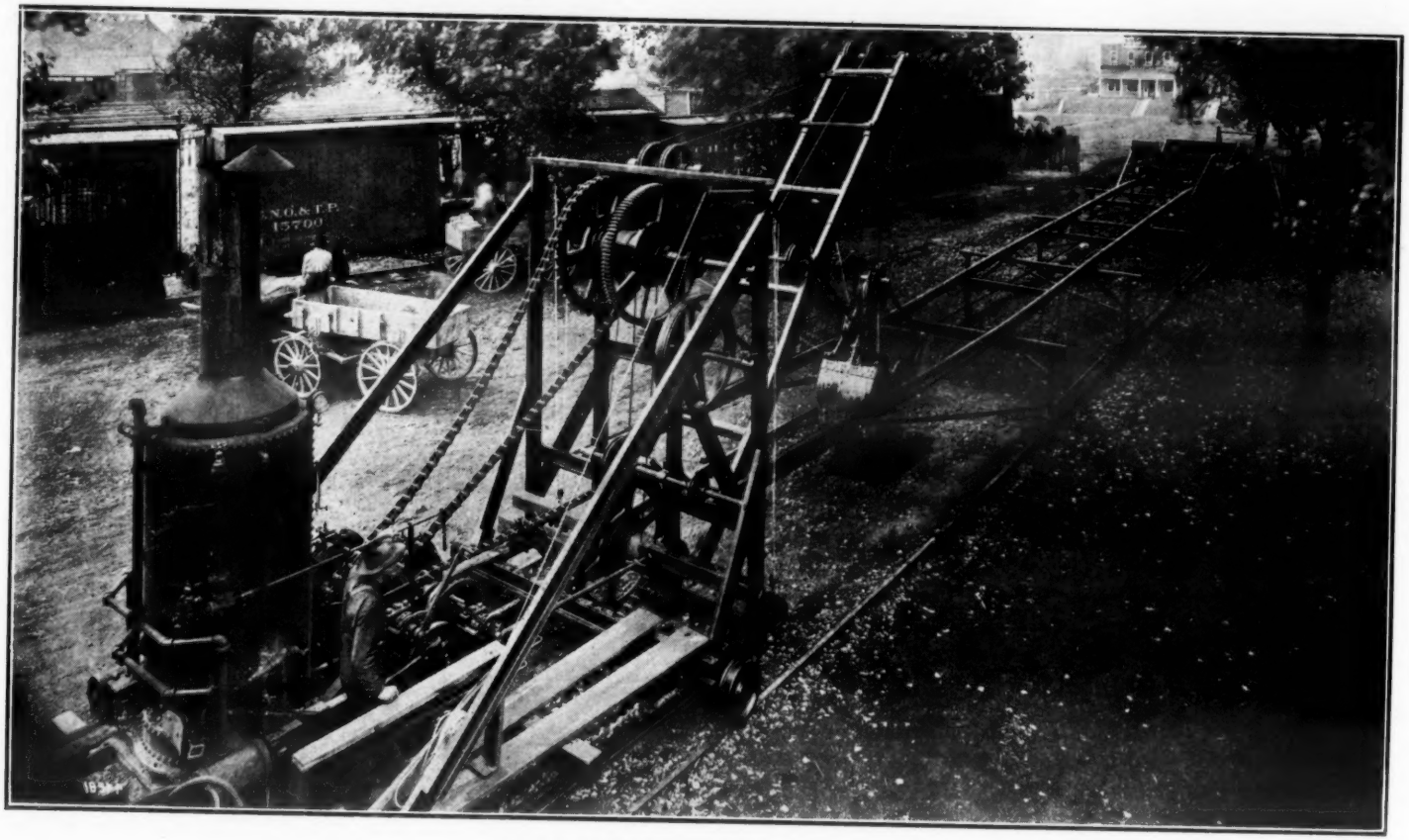
The Potter Trenching Machine.

Mr. Potter of the Potter Manufacturing Co., Indianapolis, Ind., has used the descriptive expression "Two in One" to designate their trenchng machine. The expression very fittingly describes the capability of the machine, for it accomplishes more than merely digging the trench in that it back fills the completed portion of the ditch as fast as the digging advances.

The accompanying photograph shows the machine and will serve to give some idea of its method of operation. The engine is a standard 20-horsepower engine that may be used for other work if the occasion demands. It is mounted, together with the hoisting machinery, on a platform of structural shapes, which is in turn mounted on wheels running on rails set 10½ feet apart. When in full operation the railway is continuous from end to end of the machine. To this platform is attached the boom of the digging apparatus. This boom is movable in a vertical plane and may be used in conjunction with either a clam-shell or orange-peel dipper bucket, or may be used as the ordinary steam shovel by attaching a scoop bucket rigidly to the boom arm.

Back of the digging machine extends a trestle, which may vary in length up to 300 feet. This trestle supports a track upon which a car is propelled by an endless cable operated by drums on the digging machine. At a suitable distance from the machine, braces are set at the sides of the track and a cross scraper is set at a suitable height above the track.

The method of operation is simple and effective and the entire apparatus is operated by one man. The bucket is dropped into the trench and fills itself. Then as it rises the same motion propels the car back from the farther end of the track until it is immediately under the bucket. The material is dropped on the car, which then proceeds outward along the track to the point where the cross scrapers shove the material off the car and into the trench. The motion which operates the car lowers the bucket; but after the car reaches the cross block at the end of the trestle the bucket may be lowered as much as required without in any way affecting the car. The width of the trench the machine is capable of digging is limited only by the distance between tracks.



THE NEW POTTER TRENCH MACHINE.

The machine can dig about 30 feet in a longitudinal direction at one set-up.

In moving forward all that is necessary is to throw in a gear operating a chain set on two gear wheels so as to engage itself in the ground under the engine. The entire apparatus is then moved forward on its own power. The trestle work, as well as the carriage supporting the engine and digging machinery, is set on wheels running on rails at either side of the trench, so that the machine is easily capable of moving along on its own power with little tractive resistance.

The advantages claimed for the machine are:

1. The trench is dug and back filled at one operation.
2. The depth of the trench is unlimited.
3. It can use either dipper or scoop buckets.
4. It can do double work on account of no time being lost in swinging the boom to either side.
5. It can dig any material short of solid rock.
6. The ditch is guarded by the presence of the trestle work on either side.
7. Tile may be laid immediately in advance of the fill without interference from the filling car.

Full information relative to the machine may be obtained from the Potter Manufacturing Co., Indianapolis, Ind.

A Money-Saving Trench Pump.

The C. H. & E. Manufacturing Co., 400 Mineral street, Milwaukee, Wis., have made a combination of a portable bilge or trench pump and a 3-h.p. gasoline engine on a strong skid, which is a time and muscle saver that the contractor will appreciate. It costs 20 cents a day to run the pump and it will lift 3000 to 3500 gallons an hour. Four men can carry and place it and it is always at work when wanted. The manufacturers claim that it will pay for itself on one job. The pump is of modern design and of high quality. Write to the manufacturers for further information.

Portable Acetylene Lights.

The portable light has long been a difficult problem for the contractor, as well as for others requiring lights temporarily, and with strength and flexibility enough to serve his purposes. Oil lights of all kinds are smoky, heavy or complicated or all three and are usually very inconvenient to handle. Acetylene gas makes an ideal light for such purposes, both for its convenience and portability and for its great power, being fifteen times as strong as any other burning light for the same size of flame.

The Milburn light is the result of ten years of scientific experimentation and that it is successful is shown by the sale of over 60,000 acetylene lights of over 60,000,000 candlepower.

An outer tank holds water and an inner tank holds carbide and there is a burner standpipe with a connecting flexible tube. These are the main pieces of apparatus.

There are several variations in design to fit the lamp for any demands that may be made on it, ranging in power from a 50-c.p. hand light to a 10,000-c.p. double lamp lighting 3000 feet.

The list of users of the light is long and includes many prominent contractors, factories, mines, railroads, steamships, fire departments, etc.

Not the least attractive feature of the light is its low cost.

The Alexander Milburn Co., 507 W. Lombard st., Baltimore, Md., will give full information about the light.

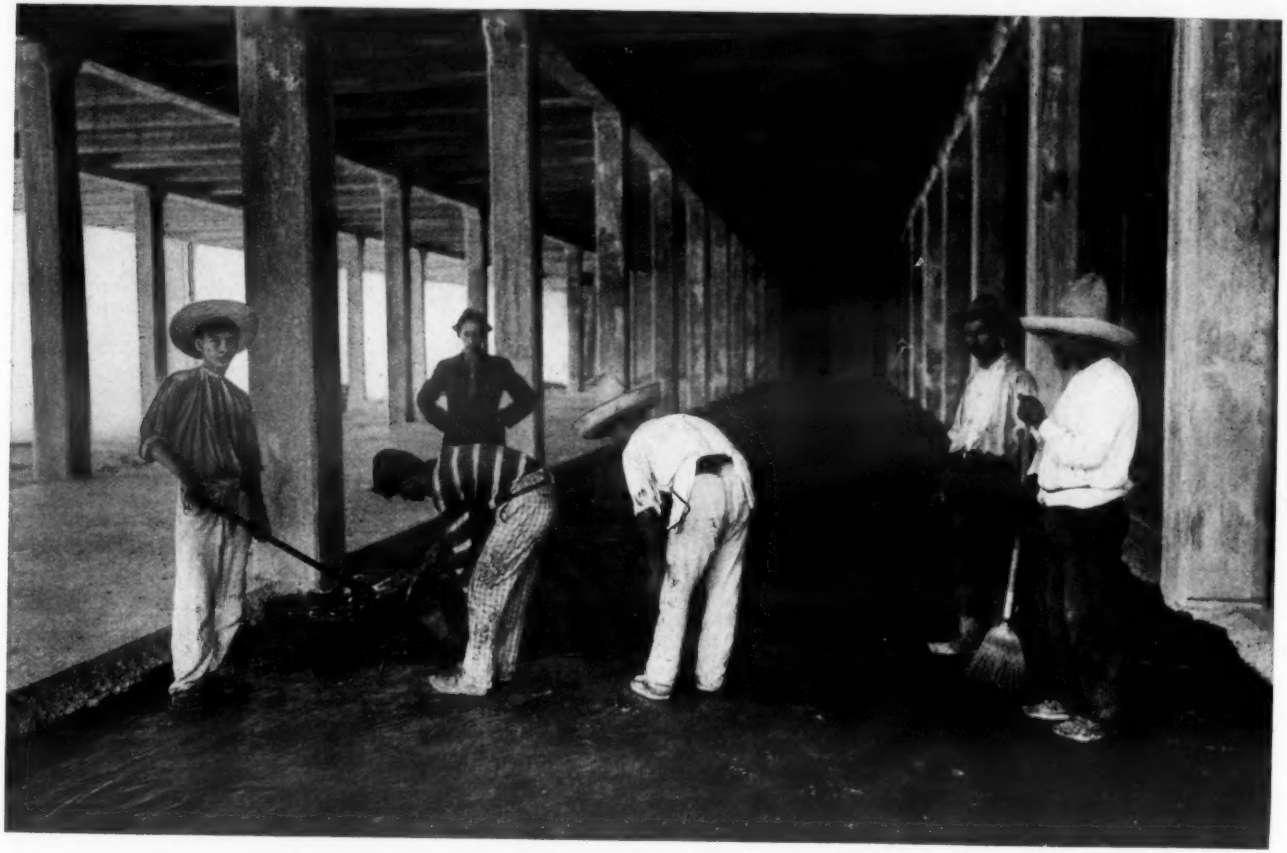
The Waterworks of Monterrey, N. L., Mexico

One of the most interesting features of the Monterrey (Mexico) water works system, which has just been completed, is the reinforced concrete distributing reservoir built for the low-pressure supply service, known as the San Geronimo gravity supply. This is situated at the extreme western limit of the city, at the foot of the Obispado hill. It is built of reinforced concrete throughout and its principal dimensions are as follows: Length, 120 linear meters (394 feet 8 inches); width, 80 meters (262½ feet); mean water depth, 4 meters (13 feet 1 inch); capacity, 40,000,000 liters (10,568,000 U. S. gallons). The top water level of the reservoir is 558 meters (1841 feet) above the sea level, and elevation sufficient to give a pressure over the district supplied varying between 27 and 70 pounds per square inch in the mains.

The reservoir has been partly excavated in a clayey formation composed of disintegrated "sillar," a local rock of secondary limestone formation, the excavated material being used to form the embankment on the north, south and east sides.

The embankments and excavated portion of the reservoir have been lined with concrete, 14 inches thick at the bottom and 10 inches thick at the top. The walls have a slope of 1 in 2 and are reinforced with ⅝-inch twisted steel lug bars. The columns supporting the roof are 16 inches in cross-section, reinforced with four ⅝-inch bars and hooped every 15 inches with ⅜-inch twisted steel. These rest on a foundation varying from 4 feet square on solid rock to 6 feet square on the softer strata of a portion of the reservoir foundation. The total number of columns is 360, spaced 5 meters (16 feet) apart. The roof consists of main primary beams 16x24 inches reinforced with four ¾-inch bars and 1x¼-inch flat stirrups, and secondary beams 10x20 inches with four ⅝-inch bars and 1x⅛-inch flat stirrups, which support a roof slab 4 inches thick reinforced with No. 8 gauge expanded metal.

The floor of the reservoir, which was



OBISPADO RESERVOIR, MONTERREY, MEX —Laying "Pioneer" Waterproofing Asphalt on floor.

laid after a great part of the roof was completed, so as to get protection from the hot sun, is formed of two thicknesses of concrete. The lower, 5 inches in thickness, was laid in alternate panels between the columns, and upon this lower thickness a waterproof layer of asphalt was laid. The material used was supplied by the American Asphaltum & Rubber Company of Chicago, Ill., and the work was carried out by ordinary Mexican labor, after receiving a few days' instructions from one of the superintendents of the asphalt company. The concrete for the floor was composed of 3½ parts of crushed limestone, 2½ parts of the same rock crushed to form sand, and 1 part of the local Hidalgo Portland cement. The concrete was brought to a comparatively smooth surface and after having been kept moist for ten days by sprinkling was allowed to get thoroughly dry and the surface was carefully swept. Upon this prepared surface one coat of "Pioneer" paint was spread with paint brushes and the asphalt poured upon it to a depth of not less than ⅛ inch after having been heated in boilers and brought to a temperature of about 425 degrees F. Where the floor joined the pedestals of the columns two coats of asphalt were applied. The finishing coat of concrete was then placed in position on the top of the asphalt, laid in panels breaking joints with the lower panels, thus giving a total thickness to the floor of 10 inches, the floor surface being carefully finished with a float, the fine stuff being brought up to the surface, but no plastering was allowed.

For the purpose of determining if the reservoir showed any signs of leakage, rubble drains 15 inches wide and 9 inches deep were laid under the floor so as to lead any leakage there might be to a 12-inch drain carried to an inspection pit outside of the reservoir. Altogether there were about 1160 linear meters (3828 feet) of drain.

The construction of the concrete work of the reservoir, which occupied about six months, was begun in the middle of January and completed in the middle of July, 1909.

The following are some of the quantities of material used in this reservoir, including the inlet valve house, central tower, outlet house, etc.

Concrete, 6003 cubic meters (7984 cubic yards); steel reinforcing bars, 170 tons, or 55.1 miles; expanded metal for roof, 3½ tons, or 2.57 acres; number of columns, 360; number of primary beams, 374; number of secondary, beams, 1184.

In addition to "Pioneer" waterproofing asphalt, covering about 2½ acres of space and a coat of "Pioneer" primer paint, the walls of the reservoir internally were given two coats of "Te-Pe-Co" waterproofing (supplied through the American Asphaltum & Rubber Company of Chicago, Ill.). "Te-Pe-Co" is a liquid mineral solution and was applied with ordinary flat brushes, two coats covering about 2236 square meters of surface, the second coat requiring less solution than the first. The first coat was applied by four laborers, at 1 peso each per day, in twelve days, making the cost of the first coat 2.15 cents, Mexican, per square meter. The second coat was applied in four days by thirteen men, at a cost of 2.33 cents, Mexican, per square meter.

The reservoir was partly filled, to a depth of 6 feet, and allowed to remain so for several weeks, and no signs of any leakage were observed. The reservoir was then emptied and refilled on August 30, in forty hours, to its full capacity, when it became necessary to make use of the low-pressure supply, due to the recent flood, which temporarily cut off the supply main of the high-pressure reservoir. Since that date there has been no leakage whatever, proving that the methods adopted to insure water-tightness were successful.

The accompanying photographs show the work of painting the first layer of floor and laying the waterproofing asphalt. The reservoir has been laid out with grass plots and gravel paths, and the whole of the area owned by the company, amounting to about thirty acres, is being developed as a public park, which, when finished, will be the most beautiful of its kind in Mexico.

The reservoir was designed by Mr. G. R. G. Conway, M. Am. Soc. C. E., M. I. Mech. E., and built under his direction.

How to Lay Bitu-Mass.

The American Paving and Manufacturing Co., Indianapolis, Ind., have issued the following specifications for laying Bitu-Mass pavement, showing the results of their careful experimentation for the past few years:

Foundation.—The earth, foundation or sub-grade will be brought to an even surface, parallel with the grade proposed for the pavement, by making the necessary excavation or embankment. Soft or spongy earth, or other material not affording a firm foundation, will be removed and the space refilled with dry earth, which shall be solidified by ramming or rolling. Any portion of the earth foundation not accessible to the roller shall be thoroughly compacted by ramming. When the rolling and ramming shall have been done, the surface of the earth foundation shall be true and smooth, and 5 inches below the proposed finished surface of the pavement.

Pavement.—Upon the earth foundation or sub-grade, prepared as above described, shall be laid the Bitu-Mass pavement, which pavement shall be composed of a natural mixture of bank or river gravel and sand, from which all stones above 1 inch have been removed, and bituminous cement, treated and laid as hereinafter specified.

The completed pavement shall be 5 inches in thickness, and shall be made as follows: The gravel and sand as above described shall, before being mixed with the bituminous cement, be passed through a rotary dryer and there subjected to a direct heat for the purpose of expelling moisture, and for the further purpose of causing these ingredients to readily unite

OBISPADO RESERVOIR, MONTERREY, MEX.—Painting the first layer of the floor.

with the bituminous cement. Before being discharged from the dryer, the gravel and sand shall be heated to a temperature of approximately 200 to 250 degrees F., the bituminous cement to be heated to approximately 250 to 300 degrees F.

Bituminous Cement.—The bituminous cement used in this mixture shall be the American Paving and Manufacturing Company's Jay brand bituminous cement.

Pavement Mixture.—The amount of bituminous cement to be used shall be determined by the amount required to thoroughly coat each particle of the gravel and sand, and to fill the remaining voids in the mixture. After the formula is thus obta'ned, giving the exact amount of weight of the gravel and sand, and the exact amount of cement for one batch, the same shall simultaneously be dumped into the mixer and the whole compound thoroughly agitated until all the particles are thoroughly coated, and the combination is a uniform, dense and plastic bitumi'rous concrete.

In this condition it shall be spread on the prepared foundation or sub-grade in two courses or layers, as follows: The first or lower course shall contain a slightly larger percentage of the cement than the second or upper course, and shall be at least 3 inches in thickness after being thoroughly compressed by rolling with a steam roller weighing at least 8 tons. The second or upper course shall then be spread on top of the lower course to such a depth that, after thorough compression with a steam roller weighing at least 8 tons, the two courses (or the entire pavement) shall have a thickness of 5 inches.

Surface Finish.—After the second or upper course has been laid to grade and rolled, and while still warm, a thin coating of Portland cement shall be swept over it, after which the rolling shall be continued until the pavement has been properly compressed.

Asphalt and Cement Testing.

The number of municipal laboratories for testing cement and for testing asphalt is rapidly increasing. The cost of apparatus is so slight that it no longer stands in the way, and the necessity of sufficiently expert supervision of construction of pavements and cement work to insure good materials has been demonstrated so conclusively that no city which is doing enough work to keep its city engineer busy can afford to neglect its testing laboratory.

Chicago now has a firm which devotes its attention to the manufacture of such apparatus, both the standard machines and tools and special apparatus to suit any particular requirements. It is fair to presume that a firm thus putting its full force on the one class of machinery is able to turn out specially satisfactory products. The Humboldt Mfg. Co., 2014 Nebraska avenue, Chicago, Ill., is the firm referred to and they will give full information on the subject of testing laboratories and apparatus on request.

Trade Publications.

The Twentieth Century grader is fully described in its many uses by the Baker Mfg. Co., Chicago, Ill., in an illustrated catalog.

High-grade engineering instruments are listed and described in a handsomely illustrated catalog of the Hanna Mfg. Co., Troy, N. Y.

Tne De Laval Steam Turbine Co., Trenton, N. J., discuss high efficiency of centrifugal pumps in a 96-page book.

Two recent booklets from the Indianapolis office of the Lehigh Portland Cement Co. describe the reinforced concrete plant of the Grape Products Co., at North East, Pa., and some reinforced concrete chimneys, with views of numerous other structures in which Lehigh cement has been used, including the brick pavement in the Indianapolis motor speedway.

The Stark Rolling Mill Co., Canton, O., has issued an interesting booklet entitled "A Valuable Treatise on Corrosion of Iron and Steel."

The Universal Portland Cement Company's latest *Farm Cement News* gives full instructions for making concrete posts and fences.

Geo. W. DeSmet, Chicago, Ill., issues a booklet of specifications for using white Portland cement mortar.

Merritt & Co., Camden, N. J., issue occasional booklets on progress in sewage treatment.

One of the handsomest catalogs received is one showing "A Quarter Century's Achievement of the Kelly-Springfield Road Roller."

The Barrett Mfg. Co. takes advantage Norfolk, Va.—The special water comof a slight mis-statement regarding tests of waterproofing materials to make a handsome correction in an equally handsomely clothed illustrated booklet about the use of coal tar pitch and the Barrett Specification in the new Pennsylvania Terminal Station in New York City.

Riehle Bros. Testing Machine Co. issue a large catalog of the large variety of U. S. standard testing machines of their manufacture.

The latest Edison *Aggregate* shows walls, piers and pockets of reinforced and plain concrete.

What do engineers think of Pioneer asphalts is answered by a map showing the cities in which they are used, which is issued by the American Asphaltum and Rubber Co. of Chicago.

The Lykens Valley Board of Trade is a new organization at Gratz, Pa., which announces its beginning with a handsome pamphlet on "The Awakening of Lykens Valley."

The latest circular of Bruno Grosche & Co., 5 Jones Lane, New York City, on S. P. F. Carbolineum and S. P. F. oil is entitled "A Handsome Walnut Stain" and shows pictures of a number of residences, factories, barns, etc., on the roof and outside woodwork of which these oils have been used.

Keuffel & Esser Co.'s latest catalog of draftsmen's, engineers' and surveyors' instruments and supplies has been received.

The Universal Portland Cement Co.'s bulletin No. 75 shows a number of reinforced concrete structures, and describes

the grandstand of one of the Chicago baseball parks.

Several booklets and circulars have been received which set forth the merits of Sarco for waterproofing foundations, track elevations and other structures, and for roof coating, Sartac for damp-proofing and Smearon for leaky roofs, all made by the Standard Asphalt and Rubber Co., Chicago, Ill.

The Tide Water Iron Works, Hoboken, N. J., issue a new catalog of their specialties, which include the Mullen gravel heaters, tar kettles and combinations of the two, asphalt kettles, reheating asphalt pans, fire wagons and asphalt paving tools of all kinds.

J. W. Howard, C. E., sets forth the facilities of his testing laboratory and inspection service for street paving in a well-worded letter from his office, 1 Broadway, New York.

Frank Cerruti, New York, sends copy of his patent on a means of cleaning sewers, showing bucket, frames, engine and method of drawing bucket through sewer, up one manhole to dump into cart and down the next manhole.

A. A. Goubert, New York, supplies steam pile driving outfits and sends a description of their operation.

Warren Smith, Faribault, Minn., has control of the Thomas concrete sewer form, of which he sends an illustrated description.

Herman F. Cuntz, Hartford, Conn., sends copy of patent for a snow-melting machine.

Henry Sieben, Kansas City, Mo., has invented a system of cleaning and disinfecting sewers which acts on a new principle and after test by the department of street repairs has been adopted for use.

Trade Notes.

ASPHALT.

Waterloo, Ia.—The asphalt plant of the Bryant-McLaughlin Company was damaged by fire July 31, entailing a loss of $1,000.

Cleveland, O.—The U. S. Circuit Court has decided that the Atlas patent dryer of the Atlas Dryer Co. does not infringe the Cummer dryer.

BRICK.

Tulsa, Okla.—The new plant of the Tulsa Paving & Building Brick Company has been put in operation.

CEMENT.

Jamaica, Ia.—A. T. Drackley of Rippey, Ia., has purchased one-half interest in the cement products business of L. Adams of this place. The machinery will be moved to Rippey and the business extended.

Ft. Dodge, Ia.—The establishment of another Portland cement plant at or near here is contemplated, according to press reports, which record the information, in West Virginia, of the Fort Dodge Portland Cement Company, which is said to have large deposits of cement shale at Gilmore City. It is not known, however, whether the plant will be located there or in Fort Dodge, where a suite of offices has been secured in the First National Bank Building. The incorporators are: F. D. Brandenberg of Sioux Falls, S. D.; M. J. Nicholson, H. W. Hendricks, Rapid City, S. D.; H. S. Van Alstine, F. J. Fishenbanner, Gilmore City.

Faribault, Minn.—D. Grant & Co., of this city, has purchased machinery for the proposed cement plant to be established at Yellowstone Park, Wyo., by the Yellowstone Portland Cement Company, in which the firm is interested.

The Roosevelt dam on Salt river in Arizona is completed and the mill, owned by the United States, which made the cement for it, will be sold at auction. The mill is said to have saved $675,000 in the construction of the dam.

CONCRETE.

Superior, Wis.—Whitney Bros. have in contemplation the establishment of a cement plant at Duluth, similar to their plant here.

Pilot Mound, Ia.—The establishment of a cement tile plant here is contemplated by N. B. Twogood of Emmetsbury, Ia.

Renwick, Ia.—W. E. Harvey will establish a cement block and tile plant here.

PURCHASE OF MACHINERY.

Antigo, Wis.—Special.—Alex Daleglis, cy. engr., is in the market for a cement testing outfit.

Omaha, Neb.—Special.—Guy Dann, 3901 N. 17th st., is in the market for a cement mixer.

Harrison, N. Y.—Special.—Wm. J. Stockmann desires to purchase two second-hand steam drills and one 20-h.p. boiler upright on wheels.

The Dalles, Ore.—Special.—L. T. Boyle, P. O. Box 237, says the question of purchasing dump wagons is still under consideration, and possibly street sweepers.

MISCELLANEOUS.

Newark, N. J.—The Sanitary Engineering & Contracting Co., 9-11 Clinton st., has been incorporated to acquire all kinds of refuse, waste, garbage, etc., and manufacture by-products therefrom by secret process. Patrick M. Lynch, Fred C. Fowler and Arthur Gutman of New York, and Abraham Henig of Newark are the incorporators.

New York City.—The construction department of the Safety Insulated Wire & Cable Company has been awarded a contract by the Middletown Gas & Electric Light Company, Middletown, Ohio, for laying underground electrical conduits and installing cables in that city for approximately $12,000. Work is progressing rapidly and the company expects to operate part of the system by September 1.

The Richmond Water Works, Richmond, Va.; Bayhead Artesian Water Co., Bayhead, N. J.; Central Union Gas Co., New York City; Oak Park Power Co., Flint, Mich.; Consolidated Ice & Power Co., Valdosta, Ga.; Peoples Incandescent Light Co., Meadville, Pa.; Greenfield Gas Light Co., Greenfield, Mass.; City Water Works, Richmond, Va.; Consolidated Gas Company of New York, 47th street and North river, New York City, have recently made purchases of Swartwout system specialties made by the Ohio Blower Co., Cleveland, O. Their patents include cast iron exhaust heads, centrifugal separators and automatic gauge glasses.

A. P. Smith Manufacturing Company, Newark, N. J., has removed its offices and works to Watsessing, N. J., where larger and more up-to-date shops will allow a greatly increased output.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

CONTEMPLATED WORK.

Milwaukee, Wis.—Brick paving is contemplated for North and 8th aves.

Hutchinson, Kas.—This city contemplates repaving and resurfacing Main st.

Brainerd, Minn.—Council will be petitioned to pave 3rd ave. with cement.

Iowa City, Ia.—Macadam paving and curbing is contemplated for Fairchild st.

Rochester, Minn.—Creosoted wood block is contemplated for Broadway st.

Santa Clara, Cal.—Specifications have been prepared for street improvements.

Portsmouth, O.—Ordinances have been adopted for improving 2nd and Offnera sts.

Beloit, Wis.—About 1 mi. of brick paving is contemplated. Robt. R. Caldwell, cy. engr.

Rochester, Pa.—Will vote in November on the issue of $100,000 bonds for paving streets.

Menasha, Wis.—The city council decided to pave Chute st., from Tayco to Main, next year.

Bedford, Ia.—Paving, curbing, etc., is contemplated for Washington and other streets.

Baltimore, Md.—B. T. Fendall contemplates resurfacing the cobblestone streets with asphalt.

Everett, Mass.—Brick and asphalt paving is contemplated for Pacific ave. and other streets.

Birmingham, Ala.—Ordinances for paving 4 streets with bitulithic are being considered by council.

Madison, Wis.—Council has ordered about 1600 sq. yds. of sheet asphalt paving on State and Pike sts.

Haywards, Cal.—Permanent paving for all unimproved streets is contemplated. T. S. Gray, town atty.

Decatur, Ill.—Ordinances have been passed for paving N. College and Broadway sts. and E. Leafland ave.

Pomona, Cal.—The board of trustees has under consideration the repairing of the asphalt pavement in 2nd st.

Independence, Kas.—Plans have been prepared for about 35 blocks of brick paving. A. D. Stivers, cy. engr.

North Yakima, Wash. — Preliminary plans are being made for constructing 5 blocks of asphalt paving in 11th st.

Hampton, Ia.—The bids submitted recently for paving were too high, and the work was deferred for another year.

Stuttgart, Ark.—Brick paving is contemplated for the main business streets and macadam for the residence streets.

Marietta, O.—An ordinance has been adopted providing for brick paving in Montgomery st. J. Henry Best, clk.

Logansport, Ind.—Paving is contemplated for Broadway, but the material has not yet been decided upon. H. H. Thompson, cy. engr.

Marshalltown, Ia.—The specifications for brick paving in this city have been changed to provide for gravel base instead of crushed stone.

Springfield, O.—Ordinances have been passed and contracts will be let about Sept. 1 for paving W. Main and E. High sts. and College ave.

Clinton, Ia.—Special.—R. C. Hart, cy. engr., has been directed to make plans and estimates for paving 3rd ave. W. E. Hayes, co. clk.

Columbus, O.—An ordinance has been passed providing for asphalt paving in Indianola ave. About 2½ mis. of paving is contemplated for N. High st.

Edna, Tex.—The county commissioners voted to issue $100,000 bonds for constructing good roads and drainage under the supervision of a competent engineer.

Wheeling, W. Va.—The board of control has asked council to appropriate $12,000 for repaving 3 blocks of Main st., and $18,100 for repaving 5 blocks of McCulloch st.

Tacoma, Wash.—The board of county commissioners has decided to construct a scenic drive along the bluff in the west side of Comment Bay, 5½ mis. long, at a cost of $47,000.

Wilmington, N. C.—Special.—The street commission proposes to commence paving the streets some time in October. No special class of paving material has yet been selected, and the commission invites correspondence from the manufacturers of different kinds of paving material, giving information as to the different towns in whch the paving is laid, the amount of paving laid, and the cost per square yard. Also, where any of the different kinds of material is at present being laid. Louis S. Belden, chm.; C. R. Humphreys, engr. comn.

Seattle, Wash.—Estimates have been reported by R. H. Thomson, cy. engr., of the cost of street improvements as follows: 34th ave., N. W. and other streets, grading, $16,800; Harrison st. and other streets, grading, $67,500; West Alaska st. and other streets, grading, $109,000; Rainier ave., grading, $32,500; 32d ave. and other streets, concrete walks, $3,900; E. 45th st. and other streets, paving, $13,000; Beacon ave. and other streets, paving, $100,000; McLellan st. and other streets, paving, $26,000; 38th ave. and other streets, paving, $18,200; Eighth ave. S., paving, $77,000; 15th ave., W., planking, $4,800; Olive st. and other streets, planking, $12,600.

Peoria, Ill.—Creosoted wood block paving is now advocated for Adams st.

Memphis, Tenn.—An ordinance has been passed to pave Springdale st. with tar macadam.

Mishawaka, Ind.—The construction of a system of paved streets this fall is contemplated.

San Antonio, Tex.—Asphalt paving is contemplated for Roosevelt ave. to the Fair grounds.

Virginia, Minn.—The residents of Poplar st. have petitioned for creosoted wood block paving.

Philadelphia, Pa.—Mayor Reyburn is in favor of resurfacing Broad st. from Jackson st. to Olney ave.

Wichita, Kan.—A resolution has been passed to pave St. Francis ave. with bitulithic. Wm. Sence, cy. clk.

Richmond, Ind.—Plans are being prepared and bids will be asked for wid-

ening, curbing and paving W. 7th, W. 8th and W. 9th sts. H. H. Hammond, prest. B. P. W.

Marshalltown, Ia.—City council voted, Aug. 22, to pave 6¼ blocks of street and alleys with brick.

Guthrie, Okla.—The construction of over 8,000 lin. ft. of cement sidewalks this fall is contemplated.

Crawfordsville, Ind.—Bids will be asked shortly for paving Sloan st. and Wabash ave. with brick or asphalt.

Iowa City, Ia.—The city council has acted favorably upon a resolution to pave a number of streets with bitulithic.

Decatur, Ind.—The city council has authorized the preparation of plans and specifications for about 3 mis. of brick paving.

Trenton, N. J.—Plans have been approved for resurfacing the Medlow turnpike, the main entrance by automobile to Atlantic City.

Hiawatha, Kas.—Plans and specifications have been approved for paving and curbing Oregon, 6th and 7th sts. J. T. Grimes, mayor.

Council Bluffs, Ia.—A resolution has been passed to repave Broadway and Main sts. with vitrified brick. S. L. Etnyre, cy. engr.

CONTRACTS TO BE LET.

Peru, Ind.—Bids are asked until Sept. 6 for constructing gravel roads. Chas. Griswold, co. audt.

Decatur, Ind.—Bids are asked until Sept. 5 for constructing a macadam road. H. S. Michaud, co. audt.

Tipton, Ind.—Bids are asked until Sept. 5 for constructing a stone road. J. F. Barlow, co. audt.

Greensburg, Ind.—Bids are asked until Sept. 5 for constructing macadam roads. Frank E. Ryan, co. audt.

Muncie, Ind.—Bids are asked until Sept. 7 for improving a public highway. Jos. E. Davis, co. audt.

Paoli, Ind.—Bids are asked until Sept. 6 for constructing 2 gravel roads. Alvin B. Ham, co. audt.

Sullivan, Ind.—Bids are asked until Sept. 6 for constructing a stone road. Ben. C. Crowder, co. audt.

Fowler, Ind.—Bids are asked until Sept. 5 for constructing a stone road. Lemuel Shipman, co. audt.

Oakland, Cal.—Bids are asked until Sept. 7 for improving 12th st. Walter B. Fawcett, secy. B. P. W.

Bronxville, N. Y.—Bids are asked until Sept. 6 for grading and paving Midland ave. Frank Dinsmore, vil. clk.

New Brunswick, N. J.—Bids are asked until Sept. 6 for constructing a stone road. Bd. chosen freeholders.

Spencer, Ind.—Bids are asked until Sept. 6 for constructing a macadam road. Geo. W. Edwards, co. audt.

Marion, Ind.—Bids are asked until Sept. 5 and 6 for constructing macadam roads. A. Y. Stout, co. audt.

Lafayette, Ind.—Bids are asked until Sept. 7 for constructing 3 gravel roads. John P. Foreman, co. audt.

Euclid, O.—Bids are asked until Sept. 12 for paving Lawnview ave. with brick. Nelson J. Brewer, vil. clk.

Rushville, Ind.—Bids are asked until Sept. 5 for constructing a macadam road. Jesse M. Stone, co. audt.

Crown Point, Ind.—Bids are asked until Sept. 6 for constructing 6 gravel roads. Chas. A. Johnson, co. audt.

Lacon, Ill.—Bids are asked until Sept. 5 for constructing a concrete sidewalk in 5th st. T. G. Green, co. clk.

Lebanon, Ind.—Bids are asked until Sept. 8 for grading, draining and gravelling a certain public highway in Sugar Creek twp. B. F. Herdrich, co. audt.

Wabash, Ind.—Bids are asked until Sept. 6 for constructing gravel and macadam roads. J. P. Noftzger, co. audt.

Vernon, Ind.—Bids are asked until Sept. 5 for constructing 2 pike roads in Campbell twp. T. L. Thomas, co. audt.

Vicksburg, Miss.—Bids are asked until Sept. 5 for widening and grading Ward Hill. J. D. Laughlin, chancery clk.

Youngstown, O.—Bids are asked until Sept. 6 for paving Caroline st. and grading Quarry, Decatur, Union and Pyatt sts.

Belleville, Ill.—Bids are asked until Sept. 3 for constructing a macadam road in O'Fallon twp. Comrs. highways.

Harrisburg, Ill.—Bids are asked until 10 a. m. Sept. 3 for constructing 1 mi. of stone macadam road. C. S. Wills, twp. clk.

Oakland, Cal.—Bids are asked until Sept. 8 for constructing an asphalt roadway in Lakeside Park. Henry F. Vogt, secy. park comn.

Youngstown, O.—Bids are asked until Sept. 6 for grading the hills on Canfield and Ellsworth roads. Will B. Jones, co. audt.

Newark, N. J.—Bids are asked until Sept. 8 for paving Pleasant Valley Way with telford. Wallace Ougheltree, dir. freeholders.

Williamsport, Ind.—Bids are asked until Sept. 5 for constructing gravel roads in Pine and Steuben twps. Robt. L. Winks, co. audt.

Harrisburg, Pa.—Bids are asked until Sept. 16 for reconstructing the National road in Brownsville borough. Joseph W. Hunter, state highway comr.

Hermosa Beach, Cal.—Bids are asked until Sept. 23 for constructing Warrenite paving on 5-in. bituminous concrete base. E. McCoskey, co. clk.

Ft. DuPont (Delaware City, Del., P. O.) —Bids are asked until Sept. 12 for macadamizing a section of Port Penn road. Constr. Q. M.

Kewanee, Ill.—Bids are asked until Sept. 6 for constructing a macadam walk, bridge and fountain base in West Park. O. D. Peterson, cy. clk.

Watertown, S. D.—Bids are asked until Sept. 6 for constructing curb and gutter along the north side of the court house square. E. L. Lampy, co. audt.

Blountsville, Ind.—Bids are asked until Sept. 6 for constructing about 3 mis. of cement sidewalks. L. J. Templin, prest. town bd.; J. C. Curtis, town clk.

Jackson, Miss.—Bids are asked until Sept. 6 for paving N. State st. with bitulithic, mineral rubber, wood block and asphalt. J. N. McLeod, st. comr.

Indianapolis, Ind.—Bids are asked until Sept. 2 for grading, graveling and sodding school grounds of No. 35 at Madison ave. and Raymond st. John E. Cleland, business dir. bd. school comrs.

New Orleans, La.—Bids are asked until Sept. 6 for creosoted wood block paving on concrete, on the river front, from Jackson ave. to St. Mary st. Hugh McCloskey, prest. bd. comrs.

Chicago, Ill.—Bids are asked until Sept. 2 for paving a number of streets with vitrified brick, creosoted wooden blocks, asphalt, etc. Albert F. Keenen, prest. bd. local impvts.

Buffalo, N. Y.—Bids are asked until 11 a. m. Sept. 2 for paving Vandalia, Republic, Ledger, Barton and Reno sts. with each kind of pavement specified in specifications. Francis G. Ward, comr. pub. wks.

Huntington, W. Va.—Bids are asked until 1 p. m. Sept. 2 for 56,500 sq. yds. of vitrified brick, sheet asphalt, asphalt block or bitulithic paving, and 24,000 lin.

ft. curb. John Coon, comr. sts.; A. B. Maupin, cy. engr.

Billings, Mont.—Bids are asked until Sept. 6 for constructing 276,366 sq. ft. of concrete sidewalks, 33,099 ft. curbing, and 13,873 ft. of cross walks. J. D. Mathewson, cy. clk.

Waukesha, Wis.—Bids are asked until Sept. 6 for constructing 12,140 sq. yds. of tar macadam paving, 6632 lin. ft. concrete curb, and 3076 cu. yds. excavation, in West ave. M. R. Butler, cy. engr.

Montevideo, Minn.—Bids are asked until Sept. 12 for constructing sidewalks. Cy. clk.

Hermosa Beach, Cal.—Bids are asked until Sept. 23 for Warrenite paving on 5 in. bituminous concrete base. E. McCoskey, cy. clk.

Tenafly, N. J.—Bids are asked until Sept. 14 for constructing a stone road. Maurice E. Lindsay, boro. clk.

Scarsdale, N. Y.—Bids are asked until Sept. 12 for resurfacing the New York Port road with bituminous macadam. Frank Sibley, town clk.

Mansfield, O.—Bids are asked until Sept. 8 for constructing 60,000 sq. ft. of cement sidewalks, and 2,000 cu. yds. of grading.

Hartford, Conn.—Bids are asked until Sept. 2 for constructing state roads in towns of Bloomfield, East Granby, Sunsbury, New Hartford, etc. State highway comr.

Atlantic, Ia.—Bids are asked until Sept. 8 for 3 mis. of asphaltic concrete paving and 6 mis. of cement curb. T. E. Nichols, cy. clk.; Chas. P. Chase, cons. engr., Clinton.

Olean, N. Y.—Bids are asked until Sept. 13 for constructing vitrified brick paving in Whitney ave., and until Sept. 15 for vitrified brick paving in Green st. Geo. H. Luther, comr. pub. wks.

CONTRACTS AWARDED.

Sandusky, O.—The contract for paving Neill st. with brick was awarded to Anthony G. O'Donnell.

Vincennes, Ind.—John Hunchler, of this city, was awarded a contract for building a gravel road.

Saginaw, Mich.—The contract for paving Genesee ave. with macadam was awarded, Aug. 23, to Crowley Bros.

Nashwank, Minn.—The contract for paving Central ave. was awarded to E. A. Dahl for $7,935.

Akron, O.—The contract for paving E. Market st. with brick was awarded to Wilders & Davison.

Clinton, Ia.—Carey & Son secured the contract for paving Main st., in Lyons, for $22,146.42.

Washington, Ind.—The contract for graveling a road was awarded to Albert Musselman for $2,499.

Youngstown, O.—The contract for paving Poland ave. was awarded to Charles Harris & Son for $32,216.

Winona, Minn.—Otis Abell secured the contract for paving Franklin st. with brick for $7,845.

Marion, Ind.—The contract for improving Adams st. was awarded to Dillard Artis at $6.87½ a lin. ft.

Antigo, Wis.—W. H. Fisher was awarded a contract for 4 blocks of macadam paving, for $81,624.

Morgantown, W. Va.—Anthony Pietro was awarded a contract for paving Holland ave. for $15,328.

Chippewa Falls, Wis.—The Concrete Co. was awarded the contract for building cement sidewalks in Bridge st.

McConnellsville, O.—The contract for paving Kennebec ave. and East and Vine sts. was awarded to Frank Beckwith, for $6,588.

Huntington, W. Va.—The contract for paving 2 blocks of Maple ave. was awarded to Henry Wright, at $1.40, and for 2 blocks in 5th ave. to Harrison & Dean at $1.42 a sq. yd.

Akron, O.—The contract for constructing stone curbing in E. Market st. was awarded to Wildes & Davidson, for $15,515, who also secured the contract for improving Renmore road, for $35,588.

Batavia, Ill.—The contract for 26,612 sq. yds. of tar macadam paving and 6,856 lin. ft. combined curb and gutter was awarded to the Interocean Paving & Construction Co., 108 Dearborn st., Chicago, for $24,875.

Leland, Miss.—The Clements Construction Co. has been awarded a contract for constructing sidewalks.

Alexandria, Ind.—J. W. Sullivan has been awarded a contract for constructing a gravel road for $2,225.

Pittsburg, Pa.—The contract for constructing the Crab Hollow road was awarded to A. G. Rothey for $17,743.89.

Bayonne, N. J.—The contract for 16,150 sq. yds. of paving in Prospect ave. was awarded to the Standard Bitulithic Co.

Youngstown, O.—The contract for paving Roland ave. was awarded to Chas. Harris & Son, Aug. 1, for $32,216.

Evansville, Ind.—The contract for paving Governor st. with brick will probably be awarded to the Bedford-Nugent Co.

Bloomfield, Ind.—Thos. Stinhard was awarded a contract for constructing a macadam road in Stockton twp. for $5,993.

Liberty, Mo.—The contract for paving the public square was awarded, Aug. 12, to J. T. Carr at $1.98½ a sq. yd.

Peoria, Ill.—John W. Bushnell was awarded a contract for resurfacing N. Madison ave. with asphalt for $33,494.08.

Ashland, Ore.—The contract for paving several streets, aggregating 62,978 sq. yds., was awarded to the Warren Construction Co.

Berlin, Ont.—Special.—The Warren Bituminous Paving Co. has been awarded a contract for 7,733 sq. yds. of bitulithic paving.

Negaunee, Mich.—The contract for paving a number of streets has been awarded to Wrick O'Connell & Co., of Houghton.

Toronto, Ont.—Special.—The contract for 6,077 sq. yds. of bitulithic paving was awarded to the Warren Bituminous Paving Co.

Walla Walla, Wash.—The contract for paving E. Alden st. was awarded to the Pacific Paving Co. at $1.87 a sq. yd.

Normal, Ill.—The contract for paving Ash st. was awarded, Aug. 11, to Roy Williams, of Bloomington, for $9,985.88.

Crawfordsville, Ind.—The contract for constructing a macadam road was awarded to Geo. B. Lynch, of Darlington, Ind.

Los Angeles, Cal.—The Barber Asphalt Paving Co. has been awarded the contract for improving Grand ave., for $8,824.

Hermosa Beach, Cal.—The contract for improving Primrose ave. was awarded to the Barber Asphalt Paving Co., for $6,000.

Reading, Pa.—The contract for paving Spring st. with drainage appurtenances was awarded to Fehr & O'Rourke, for $10,286.

Cincinnati, O.—The Kirchner Construction Co. was awarded the contract for paving York st. with granite, for $10,276.10.

Herkimer, N. Y.—The contract for paving 11,451 sq. yds. of Main st. with bitulithic was awarded to Warren Bros. Co.

Binghamton, N. Y.—The contract for resurfacing Henry st. with brick was awarded to A. D. Osborne, at $1.77 a sq. yd.

Woodburn, Ore.—Special.—The Warren

Construction Co. has been awarded a contract for 8,526 sq. yds. of bitulithic paving.

Ft. Worth, Tex.—Special.—The Texas Bitulithic Co. has been awarded a contract for 16,500 sq. yds. of bitulithic paving.

Terra Alta, W. Va.—Bateson & Co., of Wheeling, was awarded a contract, Aug. 3, for paving 1 mi. of State st., for $34,800.

Kankakee, Ill.—The contract for paving E. Court st. was awarded to John Hayes & Sons, of Naperville, for about $20,000.

Steubenville, O.—Floto Bros. Construction Co. was awarded a contract for paving and curbing Barclay ave., for $14,411.

Washington, D. C.—The contract for grading, setting and resetting curb and cobble gutters was awarded, Aug. 15, to E. G. Gummal, 300 Rhode Island ave., N. W., at 39, 27 and 37 cts. respectively.

Freeport, Ill.—The contract for paving Liberty st. with brick was awarded to Finley & Lewis, of Hoopeston, Ill., for $4,002.10.

Allentown, Pa.—George H. Hardner, of this city, was awarded a contract for building 7,000 ft. of trap rock road to Guthsville..

Sandusky, O.—The contract for paving Washington and Franklin sts. with Trinidad asphalt was awarded to the Andrews Asphalt Co.

Bloomington, Ill.—The contract for paving W. Washington st. with brick was awarded to I. D. Lain, of this city, at $1.92 a sq. yd.

Camden, N. J.—The contract for constructing an amiesite road was awarded, Aug. 10, to E. C. Humphreys, of Hackensack, for $12,114.

Herkimer, N. Y.—Special.—The contract for 11,451 sq. yds. of bitulithic paving in Main st. has been awarded to Warren Brothers Co.

York, Pa.—Special.—The contract for 1500 sq. yds. of bitulithic paving in Manchester st. was awarded to the Standard Bitulithic Co.

Houston, Tex.—The Texas Grading Co. was awarded the contract for rebuilding 2 mis. of the W. Montgomery road, for $12,000.

Elizabeth, N. J.—Special.—The contract for 4,500 sq. yds. of bitulithic paving in N. Broad st. has been awarded to B. H. Winans Co.

Salem, Ore.—Special.—Additional contracts for 31,903 sq. yds. of bitulithic paving have been awarded to the Warren Construction Co.

Portland, Ore.—Special.—Contracts aggregating 74,474 sq. yds. of bitulithic paving have been awarded to the Warren Construction Co.

Newcastle, Ind.—Special.—The Western Construction Co. has been awarded a contract for 4,406 sq. yds. of bitulithic paving in N. 11th st.

Baker City, Ore.—Special.—The Warren Construction Co. has been awarded an additional contract for 3173 sq. yds. of bitulithic paving.

York, Pa.—The Filbert Asphalt Co. was awarded contracts, Aug. 5, for paving Carlisle and Madison aves. with asphalt, at $1.78 a sq. yd.

Pasadena, Cal.—J. E. Haddock was awarded the contract for oiling, grading, curbs and gutters in Chester ave., for $6,622.

Portland, Ore.—Special.—The Warren Construction Co. has been awarded contracts aggregating 38,000 sq. yds. of bitulithic paving.

Peru, Ind.—Special.—The Western Construction Co. has been awarded a contract for 9280 sq. yds. of bitulithic paving in E. Main st.

Cincinnati, O.—The Kirchner Construction Co. was awarded the contract for improving Tafel st. with macadam and brick, for $6,842.

Canton, O.—William H. Vogt, of Massillon, was awarded a contract, Aug. 5, for paving 2.54 mis. of road in Sugar Creek twp., for $41,299.

New Orleans, La.—Special.—The contract for 3300 sq. yds. of bitulithic paving in Plum st. has been awarded to the Southern Bitulithic Co.

Baltimore, Md.—The contract for constructing 800 ft. of vitrified brick paving in Bel air road was awarded to E. Parke Lindsay, for $60,000.

Dalles City, Ore.—Special.—The contract for 13,830 sq. yds. of bitulithic paving in 4th st. was awarded to the Warren Construction Co.

New Britain, Conn.—The contract for constructing 4150 sq. yds. of bitulithic paving in Main st. was awarded to Warren Bros. Co.

Puyallup, Wash.—Special.—The Warren Construction Co. has been awarded a contract for 8,198 sq. yds. of bitulithic paving in district No. 18.

Des Moines, Ia.—The Bryant-McLaughlin Asphalt Co. has been awarded a contract for 3671 sq. yds. of paving in 23rd st., at $2.05 a sq. yd.

Chicago, Ill.—The Citizens' Construction Co. was awarded a contract, Aug. 19, for paving La Salle st. with creosoted blocks, at $3.42 a sq. yd.

Bayonne, N. J.—Special.—The Standard Bitulithic Co. has been awarded a contract for 16,150 sq. yds. of bitulithic paving in Prospect ave.

Vancouver, B. C.—Special.—The contract for 52,126 sq. yds. of bitulithic paving has been awarded to the British Columbian Bitulithic Co., Ltd.

Robinson, Ill.—The contract for constructing 1½ mis. of paved streets was awarded, Aug. 2, to Keegan Bros., of Terre Haute, for $40,000.

Cottage Grove, Ore. — Special. — The Warren Construction Co. has been awarded a contract for 7200 sq. yds. of bitulithic paving in Main st.

Salem, Ind.—The contract for constructing the Bee Line gravel road was awarded to Bert Charteau, of Campbellsburg, Ind., Aug. 1, for $11,754.

Merchantville, N. J.—The contract for constructing an amiesite road .85 mis. in length was awarded, Aug. 10, to E. C. Humphrey, of Hackensack, N. J., for $12,114.

Tarentum, Pa.—Brown & Crissman, of Kittanning, Pa., secured the contract for macadamizing 2800 sq. yds. of driveways in the Kittanning cemetery.

Niagara Falls, N. Y.—The Read-Coddington Co. was awarded a contract, Aug. 2, for paving Buffalo ave. with Toledo asphalt block, for $72,923.

Rosedale, Kas.—The contract for constructing 2620 sq. yds. of bitulithic paving in Shawnee st. has been awarded to the Kansas Bitulithic Co., of Wichita.

New Britain, Conn.—The contract for constructing 4,510 sq. yds. of bitulithic paving in Main st. for the railroad area was awarded to Warren Brothers Co.

East Moline, Ill.—The Northwestern Construction Co., of Davenport, Ia., was awarded the contract for paving ¾ mi. of 13th st. with brick, for $15,279.

Escondido, Cal.—Denny & Granville secured the contract for grading and paving with decomposed granite, Grand ave., from Jumper to Nutmeg sts., for $6,400.

Jefferson Barracks, Mo.—The contract for constructing roads, walks, etc., was awarded to John B. Turner, Pierce Bldg., St. Louis, Mo., for $3,808.

Santa Monica, Cal.—Fred H. Stout, Fay Bldg., Los Angeles, has been awarded a contract for constructing concrete roads,

sidewalks and sewer system in Seaside Terrace, for $14,600.

St. Paul, Minn.—The General Contracting Co., of Minneapolis, was awarded the contract, Aug. 4, for repaving Dayton ave. with asphalt, for $40,000.

Cottage Grove, Ore.—The contract for paving the main business street with bitulithic was awarded to the Warren Construction Co., of Portland, at $2.35 a sq. yd.

Seattle, Wash.—The contract for improving 5th ave. and 5th ave. S. and other streets was awarded to Marker, Russell & Gallagher, for $156,144.

Salt Lake City, Utah.—Bids were submitted, Aug. 8, for paving extension No. 67 as follows: P. T. Moran, Salt Lake City, $191,724; Strange & McGuire, Salt Lake City, $196,413.

Holliston, Mass.—The contract for constructing 3¼ mis. of road was awarded, Aug. 2, to C. E. Horne, of Millbury, for $8,304 for the town work and $7,782 for the state work.

Monroe, Mich.—The contract for paving N. Macomb and Washington sts. with asphalt blocks was awarded, Aug. 15, to the Asphalt Block Co., of Toledo, O., for $17,365.52 and $13,683.16.

Watervliet, N. Y.—Michael W. Nolan was awarded a contract, Aug. 12, for paving Broadway with granite block on concrete base, at $1.39 a sq. yd.; curbing, 89 cts. a lin. ft.; catchbasins, $60 each.

Decatur, Ill.—Jansen & Zoller, of Pekin, Ill., was awarded a contract, Aug. 1, for 7975 sq. yds. of vitrified block paving on 4-in. concrete base, in Marietta st., for $18,156.

Pensacola, Fla.—The contract for constructing 525,000 sq. ft. of concrete sidewalks was awarded, Aug. 10, to W. W. Hatch Sons & Co., of Goshen, Ind., at 9 cts. a sq. ft.

Crowley, La.—The contract for constructing 5 mis. of cement walks in 28 different streets was awarded to DeJersey & Beinard, of Jennings, at 12.45 cts. a sq. ft.

Gulfport, Miss.—The bids submitted Aug. 2 for constructing about 13,000 sq. yds. of cement sidewalks were rejected, so as to allow the city to correct discrepancies in the ordinance.

Leetonia, O.—(Special.)—The contract for paving Columbia st. with Bessemer block, with asphalt filler, was awarded to J. G. McGuire & Co., of New Brighton, Pa., at $1.31 a sq. yd. and 48 cts. a lin. ft. for curbing.

Waynesboro, Pa.—H. B. Baker, of this city, was awarded a contract, July 30, for moving about 23,000 cu. yds. of material, of which about 7,000 cu. yds. will be limestone rock and the remainder soft shale and earth.

Los Angeles, Cal.—Contracts have been awarded as follows: Improving Isabel st., S. McCray, $12,364; Cornwell st., D. D. Chapman, $6,621; Rockwood st., Los Angeles Bridge & Construction Co.; Morton ave., T. E. Shafer, $15,801.

Decatur, Ala.—Contracts for grading, draining and macadamizing were awarded Aug. 9, as follows: Goodrich & Crinkley, of New Decatur, 5 mis., $18,309; A. G. Patterson, of Falkville, Ala., ½ mi., $4,965.

Chariton, Ia.—J. C. Blunk, of Ottumwa, was awarded a contract for paving N. Grand st. and the street leading to the depot, at $2.04 a sq. yd. for paving, 55 cts. for curbing, 45 cts. for excavating.

Wichita, Kans.—R. L. Bobbitt & Co. secured the contract for constructing a sand-clay road in Lawrence ave., for $5,330. The Kansas Bitulithic Co. was awarded a contract for 26,255 sq. yds. of bitulithic paving in Cleveland ave.

Pittsburg, Pa.—Contracts for permanent improvement of public roads and highways were awarded, Aug. 2, as follows: Duff City and Campmeeting roads, Foley Bros., $57,430; Pennysville extension No. 4, Henry Hileman, $27,982; Troy Hill extension, No. 2, Neelan & Daly, $11,141.

Mountain View, Tenn.—The contract for curbing Dandridge pike and E. Main ave. and laying 6,000 ft. of curbing was awarded to George W. West, at 24½ cts. a lin. ft.; paving above, West Construction Co., of Chattanooga, 71 cts. a sq. yd.

Brooklyn, N. Y.—The contract for grading, etc., in Parkside ave., was awarded, Aug. 11, to the Brooklyn Alcatraz Asphalt Co., 497 Hamilton ave., for $39,707. This company was also awarded a contract, Aug. 10, for paving a traffic road in Ocean Parkway, for $61,259.

Chehalis, Wash.—Contracts for bitulithic paving have been awarded to the Warren Construction Co., as follows: Dist. No. 74, 6,835 sq. yds.; No. 75, 6,195 sq. yds.; No. 76, 4,887 sq. yds.; No. 77, 4,478 sq. yds.; No. 79, 2,164 sq. yds.

Reading, Pa.—Contracts were awarded, Aug. 3, for constructing 27,550 sq. yds. of vitrified block paving and 1,850 sq. yds. of granite block paving, as follows: Fehr & O'Rourke, vitrified block paving, $39,890; granite block paving, John E. Weidner, $4,322.

Kansas City, Mo.—Bids were opened, Aug. 19, for paving Southwest boulevard and Askew ave. The lowest bid submitted was that of the Cleveland-Trinidad Co., of Cleveland, O., but it was rejected on account of the company's negligence in its maintenance on 19th st.

Wilmington, Del.—The Horrigan Contracting Co., of this city, was awarded contracts, Aug. 16, for constructing roads as follows: Telegraph road, Dyer trap rock, $14,598; State road, Dyer trap rock, $19,000; Lore ave., Brandywine granite, $5,624. The Corcoran Construction Co., West Chester, was awarded a contract for constructing Lancaster turnpike with local stone for $37,990.

Paterson, N. J.—John R. Lee, of this city, will pave the Public Service Railway Co.'s share of Park ave., for $32,000. The Empire City Construction Co., World Bldg., New York City, will pave the city's share for $60,000. American wood block, with Berea block curbing, will be the material used.

Boise, Idaho.—Contracts for constructing 60 blocks of asphalt paving and 30 blocks of concrete paving have been awarded as follows: Coast Construction Co., of Tacoma, Wash., 14 blocks concrete, $41,759; Jacob Gustafson, of Boise, 16 blocks concrete paving, $49,257; Pacific Construction Co., of Portland, 60 blocks asphalt, $223,124.

Sheboygan, Wis.—J. Rasmussen & Sons Co., of Oshkosh, was awarded a contract for paving 26,260 sq. yds. of S. Water st. with brick. The company's bid was as follows: Metropolitan brick, $1.83½; Peebles or Townsend, $1.85; 4-in. curb, 24-in., 55 cts.; 30-in., 65 cts.; resetting, 15 cts.

Morris, Ill.—Bids for paving 2 mis. of residence streets were submitted, Aug. 2, as follows: Edward M. Lanig, of Highland Park, $36,785; Joseph Hanreddy, Chicago, $35,964; Keyes & McNamara, La Salle, $32,673; George A. Peter, Sycamore, $31,913.

Galveston, Tex.—Bids for repairing the brick pavement in Market sts., were submitted, Aug. 5, as follows: S. C. Leonard, for taking up and relaying about 781 sq. yds. of paving, 74 cts. per sq. yd.; for about 30,000 vitrified brick, $24 per M. Kelso & Vautrin, for taking up and laying paving, 73 cts. per yd.; for brick, $23 per M.

Villisca, Ia.—(Special.)—Bids were submitted Aug. 3 for vitrified brick paving on concrete base, with concrete curb, as follows: Hamilton & Schwartz, Shenandoah, Ia.: Curb, 37 cts.; paving, $1.97; excess grading, 40 cts.; overhaul grading, 2 cts. Conroy & Wright, Harlan, Ia.: 40 cts., $2.05, 40 cts. and 2 cts. O'Farrell Construction Co., Dubuque, Ia.: 49 cts., $2.09, 45 cts., 10 cts. M. Ford, Cedar Rapids, Ia., 49 cts., $1.97, 38 cts., 1½ cts. Theodore S. De Lay is engr.

Peru, Ind.—Contracts for constructing gravel roads have been awarded, as follows: Peck & Taber, Rensselaer, Ind., $5,218; George M. Good, Frankfort, Ind., $4,444; James M. Little, Indianapolis, Ind., $2,225; John F. Curran, Greencastle, Ind., $3,226; Goff-Kleyla Construction Co., Tipton, Ind., $21,248; Modlin Bros., Marion, Ind., $7,700; James F. Pierce, Delphi, Ind., $7,300.

New York City.—Bids were submitted Aug. 9 for repaving Water st., Richmond Terrace and Richmond ave., in Richmond boro, with wood blocks, as follows: U. S. Wood Preserving Co., 165 Broadway, $14,-238; Barber Asphalt Paving Co., $16,801; Empire City Contracting Co., $15,545; Jos. Johnson's Sons, $15,193; Uvalde Asphalt Paving Co., $15,383. Bids were also submitted for asphalt block paving on concrete, in Cary and Norwood aves., as follows: Barber Asphalt Paving Co., $5,-180; Hastings Pavement Co., $4,503; repaving Richmond road with iron slag block on a sand bed, Uvalde Asphalt Co., 1 Broadway, New York City, $101,239; Joseph Johnson's Sons, $10,538; Quinroy Construction Co., $10,713; repairing number of streets with brick on concrete, gutters, etc., Joseph Johnson's Sons, $29,256; Quinroy Construction Co., $31,764; Dominick Bonnaci, $28,124; vitrified brick paving on concrete foundation, Tompkins st., Oakland ave., Pennsylvania and other streets and avenues: Quinroy Construction Co., $19,450; Joseph Johnson's Sons, $17,925; Dominick Bonnaci, $18,251; C. Vanderbilt, $20,001.

Memphis, Tenn.—Contracts have been awarded as follows: For improving Latham st., from Iowa ave. to the Speedway, tar macadam paving, Roper & McTighe, $21,819; improving Waldran boulevard, from Poplar ave. to the Speedway, tar macadam paving, F. W. Jordan Contracting Co., $21,695; improving Cooper ave., from Madison to Central aves., asphalt paving, H. P. Streicher & Co., $42,763; improving Cleveland st., from Peabody to Harvard aves., resurfacing with tar macadam, E. J. Wetterstrom, $3,096; improving Cleveland st., from Peabody ave. to Poplar ave., tar macadam, Tennessee Road Co., $9,505; improving Wisconsin ave., from Kansas st. to Riverside boulevard, tar macadam, Roach & Manigan, $8,828; improving Chelsea ave., from 4th st. to the city limits, concrete paving, E. J. Wetterstrom, $27,170.

Columbus, O.—Bids for paving 11 streets and building several sewers were submitted, Aug. 3, as follows: Perry st., between King ave. and Eighth st., S. T. Knight, tar filler $4,317, cement filler $4,-277, asphalt filler $4,735; H. J. Shaw, $4,360, $4,280 and $4,580; Geigle, Garnes & Co., $4,233, $4,173 and $4,533; Budd & Bartling, $4,527, $4,407 and $4,-627; G. W. Patterson & Son, $4,201, $4,-161 and $4,401; John C. Beasley, $4,217, $4,197 and $4,417. Lazell st., from Mount st. to Sycamore st., H. J. Shaw, $11,291, $11,250 and $11,814; William M. Graham, $12,089, $11,948 and $12,653; John C. Beasley, $11,633, $11,586 and $12,056; Geigle, Garnes & Co., $11,046, $10,905 and $12,033. Harrison ave., from Second ave. to Fifth ave., Geigle, Garnes & Co., $12,-670, $12,493 and $13,024; Budd & Bartling, $14,005, $13,650 and $14,300; George W. Patterson & Son, $12,437, $12,555 and $13,145; John C. Beasley, $12,-905, $12,884 and $13,495.50; H. J. Shaw, $13,093, $12,857 and $13,624; S. T. Knight, $12,497, $12,379 and $13,854. Abbott ave., from Bryden road to Main st., Geigle, Garnes & Co., $7,798, $7,720 and $8,240; H. E. Barthman, tar filler $7,557, asphalt filler, $7,817; John C. Beasley, tar filler $8,159, cement filler $8,133, asphalt filler $8,419; A. G. Pugh, $8,499, $8,519 and $8,599. Sixth ave., from High st. to Wesley ave., Geigle, Garnes & Co., $3,810, $3,762 and $4,050; Budd & Bartling, $3,-837, $2,741 and $3,917; George W. Patterson & Son, $3,607, $3,576 and $3,768; John C. Beasley, $3,798, $3,782 and $3,-942; H. J. Shaw, $3,664, $3,616 and $3,-824. Frankfort st., from Mohawk st. to Sixth st., William M. Graham, $5,-005, $4,975 and $5,155; Geigle, Garnes & Co., $4,731, $4,686 and $4,956. Wolfel st., from Beech st. to Parsons ave., Geigle, Garnes & Co., $5,452, $5,382 and $5,852; William M. Graham, $5,678, $5,584 and $5,913; H. J. Shaw, $5,602, $5,531 and $5,813. Third st., from Moler st. to Southwood ave., Geigle, Garnes & Co., $7,-960, $7,871 and $8,441; Budd & Bartling, $8,103, $7,923 and $8,253; William M. Graham, $7,654, $7,564 and $8,164. Twenty-second st., from Livingston ave. to Columbus st., Geigle, Garnes & Co., $11,913, $11,805 and $12,417; H. E. Barthman, tar filler $11,560, asphalt filler $11,920; William M. Graham, tar filler $12,568, cement filler $12,496, asphalt filler $13,036; A. G. Pugh, $12,842, $12,859 and $12,910. Ludlow st., from Chestnut st. to Randolph st., Geigle, Garnes & Co., $3,158, $3,113 and $3,398. Sewer in Fairmont ave., Geo. F. Ames, $8,886; J. O. Jones, $7,002; John C. Beasley, $10,230.

St. Louis, Mo.—Contracts for paving have been awarded, as follows: Pacific ave., Hiram Lloyd Building and Construction Co., brick, $1,569.78; Arsenal st., Webb-Kunze Const. Co., brick, $37,183.80; Minnesota, Ruecking Const. Co., brick, $8,362.52; Twenty-first, Daniel Murphy, brick, $12,789.74; McRee, Fruin-Bambrick Const. Co., brick, $37,186.30; Lemp, Ruecking Const. Co., brick, $6,168.30; Twenty-first, Daniel Murphy, brick, $10,-359.02; Bulwer ave., Daniel Murphy, brick, $10,456.25; Victoria ave., Hiram Lloyd Building and Const. Co., brick, $13,-685.38; Crittenden, Fruin-Bambrick Const. Co., brick, $1,732.90; Duncan ave., Fruin-Bambrick Const. Co., brick, $8,995; Alaska ave., Ruecking Const. Co., brick, $15,778; Campton, G. Eyermann & Bro., brick, $5,905.28; Bertha, Heman Const. Co., brick, $2,839.82; Idaho ave., G. Eyermann & Bro., brick, $27,232.68; Juniata st., Hiram Lloyd Building and Const. Co., brick, $19,526.20; Alabama ave., Hiram Lloyd Building and Const. Co., brick, $9,-724.50; Twenty-third st., Daniel Murphy, brick, $2,793.99; Maiden Lane, Daniel Murphy, brick, $5,198.35; Natural Bridge, Fruin-Colnen Const. Co., brick, $27,-412.80; St. Louis ave., Hiram Lloyd Bldg. and Const. Co., brick, $10,754.96; Greer, Bambrick Bros. Const. Co., brick, $4,-243.86; Minnesota, G. Eyermann & Bro., brick, $6,705.96; Natural Bridge, Fruin-Colnen Const. Co., brick, $4,172.70; Glasgow, Harry F. Heman, $17,952.95; Twentieth, Jas. E. Perkinson, brick, $24,890.46; Twentieth, Wm. H. Redemeyer, $9,059.08; Twentieth, Skrainka Const. Co., brick, $52,255.90; Twentieth, Wm. H. Redemeyer, brick, $11,258.90; Arsenal, Granite-Bituminous Paving Co., macadam, $25,-294.68; Portis, Granite-Bituminous Paving Co., macadam, $9,512.21; Bent, Granite-Bituminous Paving Co., macadam, $13,505; Semple, Granite-Bituminous Paving Co., macadam, $21,272.24; Union,

Granite-Bituminous Paving Co., macadam, $27,650.79; Waldemar, Webb-Kunze Construction Co., telford, $3,773.40; McPherson, Kingshighway, Union boulevard, G. Eyermann & Bro., wood block, $27,466.43; Gay st., G. Eyermann & Bro., wood block, $2,388.40; Twelfth, G. Eyermann & Bro., wood block, $25,437.74; Twelfth, Granite-Bituminous Paving Co., wood block, $31,-168.40.

SEWERS.

CONTEMPLATED WORK.

Essex, Ia.—This town voted to construct a sewerage system.

Tekoa, Wash.—The installation of a sewerage system is contemplated.

Salina, Kans.—The construction of several sewers is contemplated.

Willmar, Minn.—Voted to issue bonds for constructing a sewerage system.

Greenville, Ia.—Plans have been completed for constructing a sewerage system.

Pleasant Ridge, O.—A sewerage system and sewage disposal plant is contemplated.

Pnoenix, Ariz.—Voted to issue bonds for installing a sewerage system. Frank Thomas, cy. recdr.

Albion, N. Y.—Plans and surveys are being discussed for the proposed new sewerage system.

Olympia, Wash.—The city engineer estimates the cost of constructing a sewer in the 5th ward, at $18,000.

St. Joseph, Mo.—Ordinances have been passed for constructing sewers in districts Nos. 22 and 40.

Delaware, O.—Resolutions have been adopted for constructing sewers in Liberty and N. Sandusky sts.

Garnett, Mo.—Bids will be received shortly for constructing sewers and sewage purification works.

Yorkville, N. Y.—Plans and specifications have been adopted for constructing sewers. Bd. trustees.

Bellefontaine, O.—Contracts will probably be awarded about Oct. 25 for constructing a sewerage system.

West Duluth, Minn.—A petition is being circulated for a sewer in Coates st., between 35th and 37th aves., West.

Ellensburg, Wash.—The city council has decided to construct the Southeast sewerage system at a cost of $12,000.

Annapolis, Md.—A commission will be appointed to devise plans and ascertain the cost of constructing a disposal plant.

Helena, Mont.—City Engineer Helmick estimates the cost of constructing an outflow sewer in the Broadwater addition at $7,380.

Fremont, Neb.—The citizens have petitioned for the extension of the sewerage system into the northwestern yart of the city.

Wapello, Ia.—The establishment of drainage district No. 13 is contemplated by the supervisors of Muscatine and Louisa counties.

East Moline, Ill.—A plan has been submitted to council for constructing 6 mis. of sewer mains in East Moline, at a cost of about $20,000.

Wichita, Kans.—Preliminary surveys have been completed for extending the city drainage canal to the Big Arkansas river, and bids will soon be asked.

Joplin, Mo.—Plans and specifications have been prepared for constructing a sewer system at an estimated cost of about $60,000. J. B. Hogddon, cy. engr.

Monrovia, Cal.—Plans have been prepared for constructing a complete sewerage system, and the question of issuing bonds will be voted on about Oct. 1.

Clinton, Ia.—(Special.)—R. C. Hart, cy. engr., has been directed to prepare plans and estimates for constructing sewers in ditsricts Nos. 3 and 4.

Birmingham, Ala.—Plans will be prepared and bids asked soon for constructing the big septic tank for this city on Cillage creek, near Easley. L. M. Satter, co. san. engr.

Caldwell, N. J.—A sewerage system is contemplated.

Annapolis, Md.—A sewage pumping plant is contemplated.

Columbus, Miss.—The construction of storm sewers is contemplated.

Toccoa, Ga.—Voted to issue bonds for constructing a sewerage system.

Erie, Pa.—A storm water sewer system in the 6th ward is contemplated.

Harrisburg, Pa.—Plans are being prepared for constructing sewers this year.

Williamsport, Pa.—Plans are being prepared for constructing a storm sewer.

Golden, Colo.—Plans have been completed for constructing sewers in sanitary dist. 2.

East Liverpool, O.—Sewers will be built in Avondale, Calcutta, Bank, Oak and other streets.

West Chester, Pa.—Council is considering the question of constructing a sewerage system.

Waupaca, Wis.—Preliminary plans for constructing a sewerage system and septic tank are being made.

Pleasanton, Kas.—Bids will be asked shortly for constructing sewers and sewage purification plant.

Tuscaloosa, Ala.—Objections will be heard Sept. 22 on the proposed construction of sanitary sewers.

Govans, Md.—The Baltimore county commissioners are considering the question of extending the sewer mains.

Texarkana, Ark.—The construction of a sewerage system in a district comprising 33 streets is contemplated.

Lancaster, O.—Bids will probably be received in November for constructing sewers on the west side. John N. Wolfe, cy. engr.

Cincinnati, O.—The village of Kennedy Heights is considering an expenditure of $150,000 for constructing a sewerage system and disposal plant.

Martinsburg, W. Va.—Calvin W. Hendrick, ch. engr. sewerage comn., will estimate the cost of a sewerage system and disposal plant.

Circleville, O.—The construction of storm water sewers at a cost of $4,500, and sanitary sewers at a cost of $15,000, is contemplated.

Morrillton, Ark.—The board of improvement, sewer dist. No. 1, will sell $25,000 6 per cent. sewer improvement bonds Sept. 15. M. A. Metzger, secy.

Norfolk, Va.—The city engineer has been directed to prepare estimates of the cost of installing sewers in Fauquier and Louisa sts., in Berkley ward.

Jeffersonville, Ind.—A resolution has been adopted for constructing a sewer in Pearl st. with branches in Maple, Chestnut and Market sts. V. W. Lyons, cy. engr.

Muskogee, Okla.—A committee has been appointed to investigate and report on the improvement of the sanitary sewer and sewage disposal plant. A. H. McGarr, mayor.

Bellevernon, Pa.—This borough, Bellevernon, Charleroi, Monessen, Donora, North Charleroi and Webster are considering the question of constructing a joint sewage disposal system.

Centerville, Md.—Bids are asked until Sept. 5 for constructing 12,500 ft. 8, 10

and 12-in. sewers; 2,400 ft. house connection, and 45 manholes. Bd. town comrs.

Omaha, Neb.—Bids are asked until Sept. 6 for constructing sewers. Dan. B. Butler, cy. clk.

Brawley, Cal.—Bids are asked until Sept. 19 for constructing a sewerage system. W. H. Whelan, cy. clk.

East Milwaukee, Wis.—Bids are asked until Sept. 7 for constructing sewers. Theodore B. Olson, vil. clk.

Grand Forks, N. D.—Bids are asked until Sept. 5 for building a lateral sewer in Oak st. Chas. J. Evanson, cy. audt.

Olean, N. Y.—Bids are asked until Sept. 13 for constructing a vitrified pipe sewer and appurtenances in Main st. Comrs. pub. wks.

Greenville, S. C.—Bids are asked until Sept. 10 for constructing 6 mis. of 8-in. sanitary extensions, etc. C. P. Ballenger, cy. engr.

Newburg, O.—Bids are asked until Sept. 17 for constructing sewer and water mains in a number of streets. J. W. Shimek, cy. clk.

Carrington, N. D.—Bids are asked until Sept. 9 for constructing a septic tank, main outlet and certain sewers in sewer dist. No. 1. Cy. coun.

Massillon, O.—Bids are asked until Sept. 3 for building a sanitary sewer in 3rd, Thorne and Water sts. Wm. A. Pietzoker, dir. pub. service.

Emmetsburg, Ia.—Bids are asked until Sept. 6 for constructing 2,987 ft. 8-in. vitrified sewer in Broadway, 14th, Union and 16th sts. T. E. Rutledge, cy. clk.

Indianapolis, Ind.—Bids are asked until Sept. 7 for constructing sewers in McPherson and Bellefontaine sts., Euclid ave. and an alley. C. A. Schrader, chm. B. P. W.

Clarion, Ia.—Bids are asked until Sept. 12 for cleaning out and deepening ditches No. 3 and 5, near Galt. E. M. Callender, co. audt.

North Braddock, Pa.—Bids are asked until 3 p. m., Sept. 2, for constructing a terra cotta pipe sewer in Main st. with 1 manhole and 1 lamphole. C. A. Stewart, boro. engr.

Owosso, Mich.—Bids are asked until Sept. 8 for constructing 1,600 ft. 24-in., 880 ft. 20-in. and 500 ft. 15-in. sewers; 80 6-in. Y branches, 12 manholes, 1 special catch-basin inlet for flushing. E. F. Joslin, engr. in ch.

CONTRACTS TO BE LET.

Emmetsburg, Ia.—Bids are asked until Sept. 6 for constructing sewers in 14th, Union, 16th and Broadway sts. T. E. Rutledge, cy. clk.

Sioux Falls, S. D.—Bids are asked until Sept. 6 for constructing 66,000 ft. 8 to 36-in. sewers. Bd. co. comrs.

Newcastle, Ind.—Bids are asked until Sept. 5 for constructing 1½ mi. of trunk sewer. W. Q. Freel, cy. engr.

Algona, Wis.—Bids are asked until Sept. 1 for constructing a vitrified pipe sewer. Wm. Neseman, Jr., cy. clk.

Cynthia, Ky.—Bids are asked until Sept. 13 for constructing a sewer in Battle Grove ave. J. A. Dougherty, clk.

Sioux Falls, S. D.—Bids are asked until Sept. 6 for constructing a trunk sewer on the West Side. Lewis Larson, cy. audt.

West View, Pa.—Bids are asked until Oct. 1 for constructing main sewers and a disposal plant. H. L. Donaldson, secy. boro.

Louisville, Ky.—Bids are asked until Sept. 2 for constructing section F of the Beargrass intercepter contract No. 73. J. B. F. Bread, engr. sewerage comn.

Evansville, Wis.—Bids are asked until Sept. 6 for a supervising engineer to supervise and look after the installation of a sewage plant. F. W. Gillman, cy. clk.

Union City, Ind.—Bids are asked until Sept. 5 for constructing a main sewer, branch and lateral sewers, connections and appurtenances. Ross C. Sutton, cy. clk.

Newburg Heights (Cleveland P. O.), O.—Bids are asked until Sept. 3 for constructing sewers in Alpha, Beta and Bridgeview aves. and Cuyahoga and other streets. A. W. Shatts, vil. clk.

Clarion, Ia.—Bids are asked until Sept. 5 for constructing a sewage settling tank and 6 in. outlet sewer from the tank to the storm sewer in street. M. F. Birdsall, secy. school bd.

Saskatchewan, Sask.—Bids are asked until Sept. 8 for all work in connection with sanitary and storm sewer and sewage disposal work for the buildings and grounds of the univerhity. Prest., university.

Baltimore, Md.—Bids are asked until Sept. 7 for constructing 23,000 lin. ft. 8 to 15 in. vitrified sewers, 30 ft. 30 in. brick and concrete sewer, and 10,000 ft. 6 in. house connections, and erecting a coal and ash handling plant in the sewage pumping station building. W. D. Platt, chmn. pro tem. sewerage comn.

CONTRACTS AWARDED.

Alameda, Cal.—The contract for constructing the south side sewer was awarded to F. H. Dahnke.

Clinto, Ia.—The contract for constructing a sewer was awarded to the Clarke Construction Co., for $1,452.15.

Dallas, Tex.—The contract for constructing the deep sewer in Elm st. was awarded, Aug. 17, to the Dallas Lime & Gravel Co., for $3,455.

Burlington, Ia.—The contract for constructing a drainage system was awarded to Richard Runell, of Oakville, for about $30,000.

South Haven, Mich.—The contract for constructing 4,000 ft. of 8 and 10-in. sewers was awarded to the Swanson Co., 834 N. Cloud st., Chicago.

Haddon Heights, N. J.—The contract for constructing a sewerage system and disposal plant was awarded to B. F. Sweeten & Son, for $56,000.

Mars, Pa.—The contract for constructing 13,344 ft. 8-in. and 2,368 ft. 10-in. sewer was awarded, Aug. 9, to Wm. Jones, of Carnegie, for $15,800.

Brookville, Ind.—The contract for constructing a sanitary sewer in N. Main st. was awarded to Dudley & Keough, of this city, for $3,426.30.

St. Louis, Mo.—The Hoffman-Hogan Construction Co. was awarded a contract for constructing the Dale ave. sewer for $75,157.41, and the contract for the Ellendale sewer was awarded to Clarke & Ansbro, for $27,125.75.

Erie, Pa.—F. J. Eichenlaub was awarded a contract for reconstructing the 9 and 12-in. lateral sewers in W. 12th st., at the following prices: 12-in. pipe, 90 cts. a foot; 9-in. pipe, 80 cts. a foot; 6-in. pipe, 40 cts. a foot; 12x9x6-in. Y or T branch, $1.10; manholes, $35.

Philadelphia, Pa.—Contracts for constructing a sewage disposal plant were awarded, Aug. 10, as follows: Pumping station, $16,200, and disposal plant, $61,356, Costello & Co.; erecting a power plant in connection with the pumping station, to the Keystone State Constructing Co., $17,350; building intercepting sewer from Frankford ave. to Pennypack creek, Edwin H. Vare, $43,000.

WATER WORKS.

CONTEMPLATED WORK.

Colbran, Colo.—A water works system is contemplated.

Mt. Blanchard, O.—A water works system is contemplated.

Milford, Neb.—A water and light plant is contemplated.

Fairbury, Neb.—The construction of a standpipe is contemplated.

Warrenton, Mo.—Voted to issue bonds for a water works and sewerage system.

Brunswick, Md.—Voted to issue $5,000 bonds for water works extension.

Yukon, Okla.—The construction of a water works system is contemplated.

Ontario, Cal.—Plans for a municipal water works system is contemplated.

Farmington, Minn.—Voted to issue $10,000 for constructing a water works system.

Broken Bow, Neb.—Voted to issue $17,000 bonds for extending the water mains.

Santa Ana, Cal.—Will vote on the issue of bonds for a new water works system.

Meriden, Conn.—The water service is to be extended to Cherry Hill water dept.

Mannsville, Okla.—Voted to issue $20,000 bonds for constructing a water works system.

Lynn, Mass.—A site has been decided upon for the proposed new mechanical filtration plant.

Mannsville, Okla.—Voted to issue bonds for constructing a water works system.

Mulvane, Kans.—Voted to issue bonds for constructing a new water works system.

Onaya, Minn.—Plans and specifications are being made for a water works system.

La Plata, Mo.—Bids will be asked in October for constructing a water works system.

South Charleston, O.—The question of erecting a water works plant is being agitated.

New Carlisle, O.—Will vote in September on the issue of bonds for a water works system.

Rockmart, Ga.—Voted to issue $35,000 bonds for constructing a water works system.

Albertville, Ala.—Voted to issue $25,000 bonds for constructing a water works system.

Steubenville, O.—The installation of a new water works system is contemplated. T. Porter, engr.

New Athens, Ill.—The constructing of a new water works system by general taxation is contemplated.

Vallejo, Cal.—Will vote in October on the issue of $90,000 bonds for water works improvements.

Saginaw, Mich.—Will vote Sept. 6 on the issue of bonds for constructing a municipal water works system.

Muskogee, Okla.—A committee has been appointed for constructing a water works system. A. L. McGare, mayor.

Spokane, Wash.—The extension of the water mains, at a cost of about $100,000, is contemplated. Mayor Pratt.

Floresville, Tex.—An additional engine and air compressor may be purchased for the water works plant.

East Peoria, Ill.—A committee has been appointed to investigate the cost of installing a water works system.

Cleveland, O.—The construction of a submerged intake for the new 9-ft. tunnel is contemplated.

New Carlisle, O.—Will vote Sept. 27 on the issue of bonds for constructing a water works system.

Hettinger, N. D.—Plans and specifications have been completed for installing a water works system.

Springfield, Mo.—Petitions are being circulated asking for municipal ownership of a water works system.

Austin, Minn.—Bids will be asked about Sept. 1 for constructing extensions to the water works system. Wm. Todd, cy. engr.

Bristol, Pa.—The state board of health has granted this city permission to establish a municipal water works system.

Hearne, Tex.—C. L. Dillard and W. A. Wilkinson have been appointed a committee to secure a water works system.

Cleveland, O.—Director Lee, of the public service, is in favor of the purchase of 2 engines for the Kirtland pumping station.

Marquette, Mich.—The question of constructing a hypochlorite of lime purification plant is under consideration.

Monroe City, Mo.—Plans and specifications have been completed and bids will be asked next spring for constructing a water works system.

La Crosse, Wis.—The erection of a new pumping plant at the La Crosse river in Levee Park, at a cost of $25,000 is contemplated.

mittee has recommended the creation of a water commission to locate an adequate water supply.

Chicago, Ill.—(Special.)—Lee Stenger, 508 S. Green st., desires to sell two Worthington duplex pumps, brass-lined cylinder.

David City, Neb.—Bids will be asked in September for constructing water extensions and a new light plant. John Martz, cy. engr.

Lansdowne, Pa.—(Special.)—A. E. Jones desires to purchase one Worthington pump, 12x18½x10½x10 in., in good condition.

Ogdensburg, N. Y.—A resolution has been passed providing for the issue of $175,000 bonds for installing a filtration plant. Bd. of ald.

New Philadelphia, O.—Voted to issue $130,000 bonds for the purpose of purchasing the water works plant now owned by a company in this city.

Clinton, Ia.—(Special.)—A. C. Hart, cy. engr., has been directed to make plans and estimates for a water works system. W. E. Hayes, cy. clk.

Oakley, Kans.—Plans and specifications have been completed and bids will be asked as soon as the plans are approved by the state board of health for a water works system.

Clarksburg, W. Va.—The water and sewerage board has submitted a report recommending changes and additions to the present system, to make it adequate for the needs of the city.

Winchendon, Mass.—The board of water commissioners has decided to drive a new well as an emergency addition to the water supply. Wm. F. Clark, supt.

Pittsfield, Mass.—The special water committee submitted its report, Aug. 12, recommending the expenditure of $458,000 for increasing the water supply. Wm. H. Swift, chmn.

Oshkosh, Wis.—The committee appointed to investigate the advisability of purchasing the water works and conducting the plant under municipal ownership reported in favor of the step at the last meeting of the council.

Tama, Ia.—(Special.)—C. A. Baughman, cy. engr., says this city desires to communicate with firms that would figure on an automatic sewage lift, comprising centrifugal pump, water wheel and automatic regulating nozzle.

CONTRACTS TO BE LET.

Carrington, N. D.—Bids are asked until Sept. 9 for extending the water mains. Cy. coun.

Detroit, Mich.—Bids are asked until

Sept. 20 for building a pumping engine. B. F. Guiney, secy. bd. water comrs.

Kewanee, Ill.—Bids are asked until Sept. 6 for replacing certain water mains. O. D. Peterson, cy. clk.

Anamosa, Me.—Bids are asked until Sept. 10 for drilling wells at the county farm. Louis Gardner, co. audt.

Cleveland, Miss.—Bids are asked until Sept. 6 for constructing a water works plant. X. A. Kramer, cons. engr., Magnolia, Miss.

Grand Forks, N. D.—Bids are asked until Sept. 5 for remodeling and reconstructing the present slow sand filter. H. G. Lykken, cy. engr.

Albany, N. Y.—Bids are asked until Sept. 7 for constructing a reservoir and dam on the West Canada creek. F. C. Stovers, supt. public works.

Evansville, Ind.—Bids are asked until Sept. 29 for furnishing and erecting 2 steam-driven pumps or pumping engines. H. L. Heilmann, secy. water bd.

Conneaut Lake, Pa.—Bids are asked until Sept. 5 for laying 9,800 ft. of 4 and 6-in. water mains, setting 17 hydrants and 16 valves. T. F. Armour, boro clk.

Arapaho, Okla.—Bids are asked until Sept. 6 for the purchase of all material required in constructing a water works and electric light plant. M. C. Main, mayor.

Grand Rapids, Mich.—Bids are asked until Sept. 8 for constructing basins and substructures of the buildings for the filtration plant. Henry J. Klevorn, prest. B. P. W.

Greeley, Colo.—Bids are asked until Sept. 10 for the enlargement and improvement of the lower Latham reservoir dam. P. A. Hartung, engr. bd. directors Lower Latham Reservoir Co.

Montreal, Que.—Bids are asked until Sept. 14 for work to be done in the River St. Lawrence, at entrance of aqueduct, to include furnishing and laying pipe, constructing concrete fill, etc. Bd. co. comrs.

Portland, Me.—Bids are asked until Sept. 12 for furnishing and laying 14 mls. of pipe, requiring 75,700 ft. 48-in. steel pipe, 21,600 tons c. i. pipe, 300 tons specials, etc. L. B. Griffin, chmn. trustees water dist.

Waterboro, Wis.—Bids are asked until Sept. 6 for constructing a reservoir, building concrete foundation for steam pumps, laying 18,000 ft. 4, 6, 8 and 10-in. water mains, and setting fire hydrants, valves and valve box. Bd. trustees.

Pella, Ia.—Bids are asked until Sept. 6 for constructing a combined water and light plant, requiring 18,000 ft. 10-in. pipe, filter gallery, well, 2 buildings, etc. A. C. Kuyper, cy. clk.; Iowa Engineering Co., cons. engrs., Clinton, Ia.

CONTRACTS AWARDED.

Orangeville, Ill.—The contract for a new water tower was awarded to Willoughby Bear, for $1,813.

Milwaukee, Wis.—The Advance Construction Co. was awarded the contract for laying 18,000 ft. of water pipe.

Rugby, N. D.—The contract for extending the water works system was awarded to L. W. Schruth, of Fargo, for $11,327.

Alliance, Mo.—The contract for the extension of the water works system has been awarded to the Katz-Craig Construction Co., of Omaha, for $19,200.

Ada, Okla.—The contract for constructing a water works system was awarded to C. A. Rees, of Tahlaquah, Okla.

Dundee, Ill.—The contract for extending the water works system of East Dundee was awarded to T. H. Inglehart, of Chi-

Weston, Ore.—The contract for water works improvement was awarded to J. L. Frankman, of Walla Walla, for $3,370.

Grand Valley, Colo.—The contract for constructing a water works system was awarded to D. G. Gordon, for $36,000.

Johnstown, Colo.—The contract for installing a water works system was awarded to Fairbanks, Morse & Co., for about $12,000.

Batavia, N. Y.—The contract for a concrete dam was awarded to the Herbert Engineering Co., of Easton, Pa., for $6,-100.

Denver, Colo.—The Holme & Allen Pipe and Construction Co. was awarded the contract for laying pipe and making repairs to the distributing system of the old South Denver plant, for $14,142.

Utica, O.—Contracts for installing a municipal water works system were awarded, Aug. 20, as follows: Pumping machinery, Weinman Pump Sup. Co., Columbia; c. i. pipe, U. S. Cast Iron Pipe & Foundry Co., of Columbus; work of installation, Cantrell Construction Co.

Gadsden, Ala.—The contract for constructing a new water plant has been awarded as follows: Casey-Hedges Co., Chattanooga, contract for boilers; Henry R. Worthington Co., New York, contract for pump, water heater and turbo-centrifugal engine; Laidlaw, Dunn, Gordon & Co., New York, contract for 3,000,000-gallon pump; General Contracting and Construction Co., Atlanta, contract for general construction and filters.

BRIDGES.

Williston, S. D.—Bids are asked until Sept. 7 for building bridges. Bd. co. comrs.

Rockport, Ind.—Bids are asked until Sept. 8 for building 7 bridges. John F. White, co. audt.

Lebanon, Ind.—Bids are asked until Sept. 8 for building 6 bridges. B. F. Herdrick, co. audt.

Carthage, Mo.—Bids are asked until Sept. 7 for constructing 4 bridges. Wm. Kohlman, co. highway engr.

Jasper, Ind.—Bids are asked until Sept. 6 for constructing 10 bridges. N. A. Sweeney, co. audt.

Leavenworth, Kas.—Bids are asked until Sept. 5 for building McQuillen bridge. J. W. Mehaus, co. clk.

Fargo, N. D.—Bids are asked until Sept. 9 for constructing a number of bridges. Arthur C. Lewis, co. audt.

Akron, O.—Bids are asked until Sept. 2 for repairing Portage st. bridge at Cuyahoga Falls. C. L. Wirth, co. clk.

Delaware O.—Bids are asked until Sept. 6 for building a bridge. W. H. Bodrutha, co. audt.

Frederick, Okla.—Bids are asked until Sept. 7 for constructing 14 steel bridges. John B. Darden, co. clk.

Bismark, N. D.—Bids are asked until Sept. 7 for constructing 2 steel bridges. I. W. Healy, co. audt.

Stillwater, Okla.—Bids are asked until Sept. 6 for building a steel bridge across the Cimarron river. Co. clk.

Augusta, Me.—Bids are asked until Sept. 9 for building a bridge over St. Johns river at Van Buren. State Comr. Highways.

Lima, O.—Bids are asked until Sept. 13 for erecting a steel bridge over Hog creek. C. R. Phillips, clk. co. comrs.

Crown Point, Ind.—Bids are asked until Sept. 7 for building a wooden bridge in Deep river. Chas. A. Johnson, co. audt.

Clinton, Ia.—Bids are asked until Sept. 13 for constructing a culvert or

bridge at Main and Spring sts. W. E. Hayes, cy. clk.

Albany, N. Y.—Bids are asked until Sept. 7 for constructing a new highway bridge over Erie canal. F. C. Stevens, supt. pub. wks.

Gaffney, S. C.—Bids are asked until Sept. 5 for constructing the steel approaches on concrete base, repairing bridge, etc. E. Felix Lipscomb, co. engr.

Columbus, O.—Bids are asked until Sept. 14 for encasing in concrete the east abutment of the Dublin bridge over the Scioto river. F. M. Sayre, co. audt.

Harrisburg, Pa.—Bids are asked until Sept. 16 for constructing a cement masonry bridge on the National Road. Jos. W. Hunter, State highway comr.

Wilkes Barre, Pa.—Bids are asked until Sept. 8 for constructing 7 river piers; 6 steel river spans; reinforced concrete viaduct, etc. Jas. M. Norris, co. controller.

Ashland, O.—Bids are asked until Sept. 7 for building 2 steel truss bridges with concrete floor and 2 new substructures of stone and concrete. T. Brindle, co. surv.

Cincinnati, O.—Bids are asked until Sept. 9 for constructing a bridge in Brierly creek rd.; until Sept. 16 for building a concrete bridge over Toad creek. Stanley Struble, prest. co. comrs.

STREET LIGHTING.

Magnolia, Ia.—An electric light system is contemplated.

Terrill, Tex.—Voted to issue bonds for electric light plant.

Thibodaux, La.—Plans have been accepted for an electric light plant.

Rutherfordton, N. C.—Voted to issue bonds to install electric light plant.

Franklin, Neb.—Will vote on the issue of bonds for erecting an electric light plant.

Vandalia, Ill. —Voted to issue bonds for repairs to the municipal electric light plant.

Victoria, Tex.—The Victoria Mfg. Co. has been awarded a contract for lighting this city with electricity.

Mapleton, Ia.—The Mapleton Gas Co. has been reorganized by J. E. Duschl, M. J. Goldberger and C. C. Jacobson.

Princeville, Ill.—Bids are asked for Sept. 3 for a municipal light plant. Will grant franchise. Vil. clk.

Culver, Ind.—The business men and residence owners have petitioned the town board for street lights.

Sacramento, Cal.—The South Sacramento Power Co. has been incorporated by H. W. Conger, Fred Ferheart, Robt. Lewis and others.

Baltimore, Md.—A report has been submitted for the cost of constructing the municipal lighting plant. B. T. Fendall, cy. engr.

Moberly, Mo.—(Special).—Al. P. Overman contemplates the establishment of a municipal gas plant and desires information along this line.

Birmingham, Ala.—The Birmingham Light and Power Co. was awarded the contract for arc lights for 5 years at $70 per light per year.

Bloomfield, N. J.—Residents of this city are considering the advisability of organizing an electric light company to light the city.

New Albany, Ind.—The contract for lighting the streets for 10 years was awarded to the United Gas and Electric Co. $55.44 per lamp per year.

What Cheer, Ia.—The city desires to contract for lighting the streets of this city. The present contract expires in Nov. W. I. Meade, mayor.

Eldoran, Wis.—The Eldoran Light and Power Co. has been incorporated by Arthur J. Plowman, August M. Olsen and Louis M. Jacobson, Terrell, Tex.

Newark, N. J.—A contract for installing electric light and power plant in the court house was awarded, Aug. 11, to the Watson-Flagg Engineering Co., for $26,500.

Charlottetown, P. E. I.—Bids are asked until Sept. 10 for supplying the city with electric light current for street and commercial purposes. W. C. Clarke, cy. clk.

Houston, Tex.—Bids are asked until Sept. 12 for the construction of a mechanical laboratory and power house for the William M. Rice Institute. E. Raphael, secy. Wm. M. Rice Inst.

New Britain, Conn.—The construction department of the Safety Insulated Wire and Cable Co. has been awarded a contract for laying electrical underground conduits for approximately $14,050.

Pella, Ia.—Bids are asked until Sept. 6 for constructing a combined light and water plant, requiring 2 a. c. generators, 2 motors, 2 engines, 2 pumps, 3 boilers, transmission line, city lighting lines, lamps, etc. A. C. Kuyper, cy. clk.; Iowa Engrg. Co., cons. engrs., Clinton.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Irvington, N. J.—Chas. Wahlers has been awarded the scavenger contract for $19,245.

Racine, Wis.—Competitive plans for a garbage incinerator will be received Sept. 6 for a plant of sufficient capacity to reduce 25 tons of garbage in 24 hours. Leslie M. Fowler, cy. clk.

East Liverpool, O.—The contract for constructing the garbage crematory was awarded to the Decarie Incinerator Co., of West Minneapolis, for $24,000. Bids are asked until Sept. 3 for constructing a building for the plant. Alex McBane, dir. pub. service.

PARKS.

Palestine, Tex.—An ordinance has been passed to call for a bond issue election for the purpose of two park sites.

Minneapolis, Minn.—The residents in the northeast have petitioned park board to extend the park boulevard.

FIRE APPARATUS.

Toledo, O.—The purchase of an auto fire engine is contemplated.

San Diego, Cal.—Voted to issue $94,000 bonds for a fire alarm system.

Memphis, Tenn.—This city may purchase 2 auto fire engines during the next year. Mayor Crump.